

**UTILITY
PATENT APPLICATION
TRANSMITTAL**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No

0557-4524-2

First Inventor or Application Identifier

Nobuaki TOMIDOKORO, et al.

Title

IMAGE FORMING DEVICE MANAGEMENT SYSTEM

U.S. PTO
09/19/98



APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents

Free Transmittal Form (e.g. PTO/SB/17)
Submit an original and a duplicate for fee processing)

Specification

Total Pages

164

3. Drawing(s) (35 U.S.C. 113)

Total Sheets

70

4. Oath or Declaration

Total Pages

a. Newly executed (original or copy)

b. Copy from a prior application (37 C.F.R. §1.63(d))
(for continuation/divisional with box 15 completed)

i.

DELETION OF INVENTOR(S)

Signed statement attached deleting inventor(s) named
in the prior application, see 37 C.F.R. §1.63(d)(2) and
1.33(b).

5. Incorporation By Reference (usable if box 4B is checked)

The entire disclosure of the prior application, from which a copy of the
oath or declaration is supplied under Box 4B, is considered to be part
of the disclosure of the accompanying application and is hereby
incorporated by reference therein.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

ACCOMPANYING APPLICATION PARTS

6. ☐ Assignment Papers (cover sheet & document(s))
7. ☐ 37 C.F.R. §3.73(b) Statement ☐ Power of Attorney
(when there is an assignee)
8. ☐ English Translation Document (if applicable)
9. ☒ Information Disclosure Statement (IDS)/PTO-1449 ☒ Copies of IDS Citations (4)
10. ☐ Preliminary Amendment
11. ☒ White Advance Serial No. Postcard
12. ☐ Small Entity Statement(s) ☐ Statement filed in prior application. Status still proper and desired.
13. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
14. ☒ Other: Notice of Priority, List of Inventors' Names and Addresses, List of Related Cases, Statement of Relevancy

15. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application no.:

Prior application information: Examiner:

Group Art Unit:

16. Amend the specification by inserting before the first line the sentence:

☐ This application is a ☐ Continuation ☐ Division ☐ Continuation-in-part (CIP)
of application Serial No. Filed on

☐ This application claims priority of provisional application Serial No.

Filed

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Docket No. 0557-4524-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

* INVENTOR(S) Nobuaki TOMIDOKORO, et al.

SERIAL NO: New Application

- FILING DATE: Herewith

FOR: IMAGE FORMING DEVICE MANAGEMENT SYSTEM

FEE TRANSMITTAL

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

FOR	NUMBER FILED	NUMBER EXTRA	RATE	CALCULATIONS
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<input type="checkbox"/> MULTIPLE DEPENDENT CLAIMS (If applicable)			+ \$260 =	\$0.00
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TOTAL OF ABOVE CALCULATIONS				\$1,442.00
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Respectfully Submitted,

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Docket No. 0557-4524-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Nobuaki TOMIDOKORO, et al.

FILING DATE: Herewith

FOR: IMAGE FORMING DEVICE MANAGEMENT SYSTEM

LIST OF INVENTORS' NAMES AND ADDRESSES

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SIR:

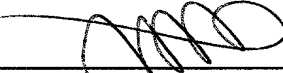
Listed below are the names and addresses of the inventors for the above-identified patent application.

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Tetsuo ASAKAWA	Tokyo, Japan
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A declaration containing all the necessary information will be submitted at a later date.

Respectfully Submitted,

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SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT WE, NOBUAKI TOMIDOKORO, a citizen of Japan residing at Kanagawa, Japan, TETSUO ASAKAWA, a citizen of Japan residing at Tokyo, Japan, SHOHZOH MIYAWAKI, a citizen of Japan residing at Saitama, Japan and HIROSHI NISHIDA, a citizen of Japan residing at Kanagawa, Japan have invented certain new and useful improvements in

IMAGE FORMING DEVICE MANAGEMENT SYSTEM

of which the following is a specification:-

1 BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to an image forming device management system in which a plurality of image forming devices, such as copiers, facsimiles, or printers, are linked through a communication device to a central service station, and each image forming device can automatically transmit a message to the central service station while the image forming devices can be remotely controlled by the central service station.

(2) Description of the Related Art

As disclosed in Japanese Laid-Open Patent Application Nos. 8-116399, 6-329298 and 8-331355, there is known an image forming device management system in which a plurality of image forming devices are linked through a communication device to a central service station.

Japanese Laid-Open Patent Application No. 8-116399 discloses a system in which a plurality of image forming devices connected to a communication control unit via a signal line, located on a user site, are linked to a central service station at a remote location through a communication network.

In the system of the above publication, when the signal line between the image forming device and the communication control unit is in a disconnected state,

1 the central service station is unable to communicate with
the image forming device. Hence, as the central service
station is unable to detect whether the image forming
device is in a disconnected state, it is difficult for the
5 central service station to speedily provide a maintenance
service for the image forming device during its
disconnected state.

Japanese Laid-Open Patent Application No.
6-329298 discloses an image forming device maintenance
10 system in which, when a jam of an image forming device (or
a copier) occurs, a determination as to whether the copier
requires a maintenance service is made on the side of the
copier based on its troubled condition. If it is
determined that the maintenance service is required, the
15 copier automatically transmits a service request to a
central service station via a communication device.
According to the system of the above publication, when the
service request from the copier is received by the central
service station, it is possible to have a serviceman
20 speedily visit the user site and properly recover the
troubled condition of the copier.

In the system of the above publication,
every time the determination that the maintenance service
of the copier is required is made, the service request is
25 automatically transmitted from the copier to the central

1 service station. For example, when a jam of the copier
frequently occurs, the automatic service request
transmission and receiving must be repeated many times by
the system of the above publication. Hence, the system of
5 the above publication is likely to be in a situation that
the automatic service request transmission and receiving
is performed too many times although it is not necessary.

Japanese Laid-Open Patent Application No.
8-331355 discloses a method of automatically transmitting
10 a maintenance service start message and a maintenance
service end message from an image forming device on a user
site to a central service station at a remote location
when a maintenance service of the image forming device on
the user site is initiated and terminated by a serviceman.

15 However, it is difficult for the method of
the above publication to carry out an automatic message
transmission of the image forming device in an appropriate
situation during the maintenance operation of the image
forming device by the serviceman.

20 In addition to the maintenance service
start/end messages, there are other messages which should
be automatically transmitted to the central service
station even during the maintenance service of the image
forming device (or the copier). For example, when a lack
25 of replenishment parts, such as toner, occurs, it is

1 desirable to automatically transmit a replenishment part
supply request from the copier to the central service
station even during the maintenance service of the copier.
Further, there are further messages which should not be
5 automatically transmitted to the central service station
during the maintenance service of the copier. For
example, when a certain error of the copier occurs after
the start of the maintenance service of the copier, it is
undesirable to automatically transmit its error message
10 from the copier to the central service station because the
serviceman has already visited the user site. Hence,
there is a demand for an image forming device maintenance
system which starts an automatic message transmission only
in an appropriate situation when a maintenance operation
15 of the copier is performed by a serviceman.

Further, statistical data of the copier
related to its troubled condition may be changed during a
maintenance service by a serviceman, and it is necessary
to reset the statistical data of the copier at the end of
20 the maintenance service. If it is not reset, the copier
may erroneously transmit an error message to the central
service station, because of the changed data, after the
maintenance service of the copier.

Further, as disclosed in Japanese Laid-Open
25 Patent Application No. 5-276260, there is known a

1 facsimile management system in which a facsimile is linked
to a central service station (or a communication
terminal), and the central service station can write
information to or read information from operating
5 parameters retained in an internal memory of the
facsimile. When accessing the internal memory of the
facsimile, it is necessary to designate an absolute
address of the internal memory at which an operating
parameter is retained.

10 Similar to the facsimile management system
of the above type, there is known an image forming device
management system in which a plurality of image forming
devices, such as copiers, connected to a communication
device on a user site, such as a customer office, are
15 linked through a public switched network to a central
service station at a remote location, such as a sales or
service location.

The above-described image forming device
management system is intended to efficiently and speedily
20 provide a service for the image forming devices by
carrying out (1) a communication control of the central
service station to the image forming devices, (2) a
communication control of each of the image forming devices
to the central service station, and (3) a control of the
25 communication device by itself.

1 Further, there is known an image forming
device management system having a block billing function.
The block billing function is provided for the image
forming device management system to establish a charge for
5 a predetermined number of copy sheets as a contract for
use of an image forming device.

 However, it is difficult for the above-
described image forming device management to provide an
efficient operation of the block billing function or a
10 precise management of the image forming devices. It is
difficult to provide an easy-to-use image forming device
management system for the user.

 For example, there are various kinds of
image forming devices which are connected to an image
15 forming device management system having a block billing
function. An address of the memory of each of the image
forming devices for retaining an operating parameter is
different from one another if the image forming devices
are of different models or of different versions.

20 In the image forming device management
system, such as that of Japanese Laid-Open Patent
Application No. 5-276260 mentioned above, it is necessary
to designate an absolute address of the memory of one
image forming device (at which an operating parameter is
25 retained) when accessing the memory of the image forming

1 device. However, if the image forming devices connected
to the system are of different kinds, then it is necessary
to deal with individual absolute addresses of the memory
for each of different kinds of image forming devices. In
5 this case, the management method for such image forming
devices will be considerably complicated. This makes it
difficult to take actions to upgrade the image forming
device management system.

Further, there is known an image forming
10 device management system in which a maintenance service
start message and a maintenance service end message are
transmitted from an image forming device to a central
service station when a message transmit operation is
manually performed by a serviceman at the start and the
15 end of the maintenance service of the image forming
device. In the above-described system, the message
transmission control is carried out when a service
program, stored in the image forming device, is executed.

However, if the serviceman fails to perform
20 the message transmit operation, the central service
station does not receive the maintenance service start/end
messages. In such a case, the central service station
does not recognize a time the maintenance service of the
image forming device is initiated or terminated by the
25 serviceman. Hence, it is likely that the above-described

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1 system cannot provide a precise management of the image
forming devices.

SUMMARY OF THE INVENTION

5 A first object of the present invention is
to provide an image forming device management system which
speedily provides a maintenance message for a user of one
of image forming devices when a separation of a signal
line between a communication control unit and the image
10 forming device is detected.

A second object of the present invention is
to provide an image forming device management system which
effectively inhibits an automatic message transmission
from one of a plurality of image forming devices to a
15 central service station when a jam of the image forming
device or the like occurs.

A third object of the present invention is
to provide an image forming device management system which
starts an automatic message transmission only in an
20 appropriate situation when a maintenance service of an
image forming device is performed by a serviceman.

A fourth object of the present invention is
to provide an image forming device management system which
efficiently carries out a block billing function.

25 A fifth object of the present invention is

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1 to provide an image forming device management system which
provides a precise management of image forming devices by
performing a block billing function in a simple manner.

5 A sixth object of the present invention is
to provide an image forming device management system which
provides an easy-to-use management operation for the user.

A seventh object of the present invention
is to provide an image forming device management system
which provides a simple management scheme for a central
10 service station and need not deal with individual absolute
addresses of the memory for each of different kinds of
image forming devices.

An eighth object of the present invention
is to provide an image forming device management system
15 which is able to manage an accurate time of a start or an
end of a maintenance service of each of image forming
devices.

The above-mentioned first object of the
present invention is achieved by an image forming device
20 management system which includes a plurality of image
forming devices, a central service station which provides
a maintenance service for the image forming devices, and a
communication control unit which is connected to each of
the image forming devices by a signal line, the
25 communication control unit connecting one of the image

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1 forming devices to the central service station via a
communication network, wherein each of the image forming
devices includes a message unit which outputs a signal
line separation message when the image forming device has
5 no signal from the central service station or the
communication control unit over a predetermined period.

According to the present invention, when
the image forming device of concern does not receive a
signal from the central service station or the
10 communication control unit over the predetermined period,
the image forming device outputs the signal line
separation message. This allows the user of the image
forming device to recognize a separation of the signal
line between the image forming device and the
15 communication control unit. Hence, it is possible for the
image forming device management system of the present
invention to speedily provide a maintenance message for
the user of the image forming device when a separation of
a signal line between the image forming device and the
20 communication control unit occurs.

The above-mentioned second object of the
present invention is achieved by an image forming device
management system which includes a plurality of image
forming devices, a central service station which provides
25 a maintenance service for the image forming devices, and a

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1 communication control unit connected to each of the image
forming devices, the communication control unit connecting
one of the image forming devices to the central service
station via a communication network, wherein each of the
5 image forming devices includes: a jam detection unit which
detects a jam of the image forming device; an image
formation detection unit which detects a normal end of
image formation by the image forming device; a remote
message unit which transmits a first remote message
10 through the communication control unit to the central
service station, the first remote message indicating that
the jam of the image forming device is continuously
detected for a predetermined number of copy sheets before
the normal end of image formation by the image forming
15 device is detected; and a remote message inhibition unit
which inhibits the remote message unit from transmitting a
subsequent remote message after the transmission of the
first remote message until the normal end of image
formation by the image forming device is detected.

20 According to the present invention, the
remote message inhibition unit inhibits the automatic
message transmission until the normal end of image
formation is detected. It is possible to effectively
inhibits the automatic message transmission from the image
25 forming device to the central service station when a jam

1 of the image forming device occurs.

The above-mentioned second object of the present invention is achieved by an image forming device management system which includes a plurality of image forming devices, a central service station which provides a maintenance service for the image forming devices, and a communication control unit connected to each of the image forming devices, the communication control unit connecting one of the image forming devices to the central service station via a communication network, wherein each of the image forming devices includes: a jam detection unit which detects a jam of the image forming device; an image formation detection unit which detects a normal end of image formation by the image forming device; a remote message unit which transmits a remote message through the communication control unit to the central service station, the remote message indicating that the jam of the image forming device is continuously detected for a predetermined number of copy sheets before the normal end of image formation by the image forming device is detected; a time counter which outputs a time count indicating a period of the jam of the image forming device; and a remote message inhibition unit which inhibits the remote message unit from transmitting the remote message when the time count output by the time

1 counter exceeds a predetermined value.

According to the present invention, the remote message inhibition unit inhibits the automatic message transmission when the time count output by the
5 time counter exceeds a predetermined value. It is possible to effectively inhibits the automatic message transmission from the image forming device to the central service station when a jam of the image forming device occurs.

10 The above-mentioned third object of the present invention is achieved by an image forming device management system which includes a plurality of image forming devices, a central service station which provides a maintenance service for the image forming devices, and a
15 communication device which connects one of the image forming devices to the central service station via a communication network, wherein each of the image forming devices includes: a remote message unit which transmits a remote message through the communication device to the
20 central service station when a maintenance service of the image forming device is initiated or terminated by a serviceman; and a non-volatile memory which retains a content of a serviceman visit flag, the serviceman visit flag indicating whether the maintenance service of the
25 image forming device is initiated or terminated by the

1 serviceman.

According to the present invention, each of the image forming devices in the image forming device management system includes the non-volatile memory which
5 retains the content of the serviceman visit flag, the serviceman visit flag indicating whether the maintenance service of the image forming device is initiated or terminated by the serviceman. By using the non-volatile memory, it is possible to start an automatic message
10 transmission only in an appropriate situation when a maintenance service of an image forming device is performed by a serviceman.

The above-mentioned fourth object of the present invention is achieved by an image forming device management system which includes a plurality of image
15 forming devices, a central service station which provides a maintenance service for the image forming devices, and a communication device which connects one of the image forming devices to the central service station via a
20 communication network, wherein each of the image forming devices includes: a receiving unit which receives a non-resettable copy count and a remote message cycle, both transmitted to the image forming device by the central service station through the communication device, the copy
25 count indicating a predetermined number of copy sheets

1 with respect to a contract for use of the image forming
device, the remote message cycle indicating a frequency at
which the image forming device transmits a remote message
to the central service station; a first storage unit which
5 stores the copy count and the remote message cycle
received by the receiving unit; a second storage unit
which stores a current copy count that is incremented
every time an image formation of one copy sheet is
performed by the image forming device; a control unit
10 which sets the image forming device in a remote message
enable state when a difference between the current copy
count and the received copy count reaches an integral
multiple of the remote message cycle; and a remote message
unit which transmits the remote message through the
15 communication device to the central service station after
the image forming device is set in the remote message
enable state by the control unit.

According to the present invention, the
image forming device of concern is set in the remote
20 message enable state when the difference between the
current copy count and the received copy count reaches an
integral multiple of the remote message cycle. The remote
message unit transmits the remote message to the central
service station after the image forming device is set in
25 the remote message enable state. It is possible for the

1 image forming device management system of the present
invention to efficiently carry out a block billing
function.

5 The above-mentioned fifth object of the
present invention is achieved by an image forming device
management system which includes a plurality of image
forming devices, a central service station which provides
a maintenance service for the image forming devices, and a
communication device which connects one of the image
10 forming devices to the central service station via a
communication network, wherein each of the image forming
devices includes: a receiving unit which receives a non-
resettable copy count and a remote message cycle, both
transmitted to the image forming device by the central
15 service station through the communication device, the copy
count indicating a predetermined number of copy sheets
with respect to a contract for use of the image forming
device, the remote message cycle indicating a frequency at
which the image forming device transmits a remote message
20 to the central service station; a first storage unit which
stores the copy count and the remote message cycle
received by the receiving unit; a second storage unit
which stores a current copy count that is incremented
every time an image formation of one copy sheet is
25 performed by the image forming device; a control unit

1 which sets the image forming device in a remote message
enable state when a difference between the current copy
count and the received copy count reaches an integral
multiple of the remote message cycle; and a remote message
5 unit which transmits the remote message through the
communication device to the central service station after
the image forming device is set in the remote message
enable state by the control unit, and wherein the remote
message transmitted to the central service station by the
10 remote message unit includes a remote message purpose and
the current copy count.

It is possible for the image forming device
management system of the present invention to provide a
precise management of the image forming devices by
15 performing a block billing function in a simple manner.

The above-mentioned sixth object of the
present invention is achieved by an image forming device
management system which includes a plurality of image
forming devices, each of the image forming devices having
20 operating parameters stored in a memory of the image
forming device, and absolute addresses of the memory where
the respective operating parameters are stored being
predetermined according to a kind of each operating
parameter, a central service station which reads
25 information from or writes information to the operating

1 parameters of one of the image forming devices by
transmitting an access request to said one of the image
forming devices, and a communication device which connects
one of the image forming devices to the central service
5 station via a communication network, wherein the central
service station includes: a parameter code transmitting
unit which transmits a parameter code, indicating a kind
of a particular one of the operating parameters, through
the communication device to one of the image forming
10 devices when transmitting an access request to said one of
the image forming devices, and wherein each of the image
forming devices includes: an address determination unit
responsive to the access request which determines a
particular absolute address of the memory of the image
15 forming device in accordance with the parameter code
transmitted by the code transmitting unit; and an access
request processing unit which accesses the particular one
of the operating parameters at the absolute address of the
memory determined by the address determination unit.

20 According to the present invention, each of
the image forming devices in the image forming device
management system has the absolute addresses of the memory
where the respective operating parameters are stored which
are predetermined according to the kind of each operating
25 parameter. The access request processing unit accesses

1 one of the operating parameters at an absolute address of
the memory determined by the address determination unit.
It is possible to avoid dealing with individual absolute
addresses of the memory for each of different kinds of
5 image forming devices. It is possible to provide an easy-
to-use management operation for the user.

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The above-mentioned seventh object of the
present invention is achieved by an image forming device
management system which includes a plurality of image
10 forming devices, each of the image forming devices having
operating parameters stored in a memory of the image
forming device, and absolute addresses of the memory where
the respective operating parameters are stored being
predetermined according to a kind of each operating
15 parameter, a central service station which reads
information from or writes information to the operating
parameters of one of the image forming devices by
transmitting an access request to said one of the image
forming devices, and a communication device which connects
20 one of the image forming devices to the central service
station via a communication network, wherein the central
service station includes: a parameter code transmitting
unit which transmits a parameter code, indicating a kind
of a particular one of the operating parameters, through
25 the communication device to one of the image forming

1 devices when transmitting an access request to said one of
the image forming devices, and wherein each of the image
forming devices includes: an address determination unit
responsive to the access request which determines a
5 particular absolute address of the memory of the image
forming device in accordance with the parameter code
transmitted by the code transmitting unit; and an access
request processing unit which accesses the particular one
of the operating parameters at the absolute address of the
10 memory determined by the address determination unit, and
wherein the image forming devices are of different models
and share a common parameter code indicating an identical
kind for the operating parameters of the individual image
forming devices regardless of the model of each image
15 forming device.

According to the above-described image
forming device management system, it is possible to
provide a simple management scheme for the central service
station and need not deal with individual absolute
20 addresses of the memory for each of different kinds of
image forming devices.

The above-mentioned eighth object of the
present invention is achieved by an image forming device
management system which includes a plurality of image
25 forming devices, a central service station which provides

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1 a maintenance service for the image forming devices, and a
communication device which connects one of the image
forming devices to the central service station via a
communication network, wherein each of the image forming
5 devices includes: a first request unit which outputs a
mode shift request to the image forming device, the mode
shift request initiating a shift of the image forming
device to a maintenance mode; a maintenance mode start
unit which sets the image forming device in the
10 maintenance mode in response to the mode shift request
output by the first request unit; a first remote message
unit which transmits a first remote message through the
communication device to the central service station in
response to the mode shift request output by the first
15 request means, the first remote message indicating a start
of a maintenance service of the image forming device; a
second request unit which outputs a maintenance end
request to the image forming device, the maintenance end
request terminating the maintenance mode of the image
20 forming device; and a second remote message unit which
transmits a second remote message through the
communication device to the central service station in
response to the maintenance end request output by the
second request unit, the second remote message indicating
25 an end of the maintenance service of the image forming

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1 device.

Further, the above-mentioned eighth object
of the present invention is achieved by an image forming
device management system which includes a plurality of
5 image forming devices, a central service station which
provides a maintenance service for the image forming
devices, and a communication device which connects one of
the image forming devices to the central service station
via a communication network, wherein each of the image
10 forming devices includes: a first request unit which
outputs a mode shift request to the image forming device,
a first display unit which displays a first mode shift key
in response to the mode shift request output by the first
request unit, a second request unit which initiates a
15 shift of the image forming device to a maintenance mode
when the first mode shift key displayed by the first
display unit is turned ON; a maintenance mode start unit
which sets the image forming device in the maintenance
mode when the shift of the image forming device to the
20 maintenance mode is initiated by the second request unit;
a first remote message unit which transmits a first remote
message through the communication device to the central
service station when the shift of the image forming device
to the maintenance mode is initiated by the second request
25 unit, the first remote message indicating a start of a

1 maintenance service of the image forming device; a third
request unit which outputs a maintenance end request to
the image forming device, the maintenance end request
terminating the maintenance mode of the image forming
5 device; and a second remote message unit which transmits a
second remote message through the communication device to
the central service station in response to the maintenance
end request output by the second request unit, the second
remote message indicating an end of the maintenance
10 service of the image forming device.

It is possible for the above-described
image forming device management system to manage an
accurate time of the start or the end of the maintenance
service of each of image forming devices by the
15 serviceman.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of
the present invention will be more apparent from the
20 following detailed description when read in conjunction
with the accompanying drawings in which:

FIG. 1 is a block diagram of one embodiment
of an image forming device management system of the
present invention;

25 FIG. 2 is a block diagram of a control part

1 of a copier in the image forming device management system
of FIG. 1;

FIG. 3 is a block diagram of a
communication control unit CCU in the image forming device
5 management system of FIG. 1;

FIG. 4 is a block diagram of a central
service station CSS in the image forming device management
system of FIG. 1;

FIG. 5 is a diagram for explaining a
10 communication sequence of a remote message transmission
when a remote message key is turned ON;

FIG. 6 is a diagram for explaining a
communication sequence of a remote message transmission
when a self-diagnostic error takes place;

15 FIG. 7 is a diagram for explaining a
communication sequence of a remote message transmission
when an advance warning remote message is transmitted;

FIG. 8A, FIG. 8B and FIG. 8C are diagrams
for explaining respective communication sequences when a
20 read request, a write request and an execute request are
transmitted to the copier by the CSS;

FIG. 9A, FIG. 9B and FIG. 9C are diagrams
for explaining respective communication sequences when a
read request, a write request and an execute request are
25 transmitted to the CCU by the CSS;

1 FIG. 10 is a diagram for explaining a
communication sequence when a read request is transmitted
to the copier by the CCU;

5 FIG. 11 is a diagram for explaining various
parameters which are set in the CCU;

FIG. 12A, FIG. 12B and FIG. 12C are
diagrams for explaining data formats of messages when a
remote message transmission is performed;

10 FIG. 13A, FIG. 13B and FIG. 13C are
diagrams for explaining data formats of messages when a
request is transmitted to the copier by the CSS;

FIG. 14A, FIG. 14B and FIG. 14C are
diagrams for explaining data formats of messages when a
request is transmitted to the CCU by the CSS;

15 FIG. 15A and FIG. 15B are diagrams for
explaining data formats of messages when a request is
transmitted to the copier by the CCU;

20 FIG. 16 is a flowchart for explaining a
remote message transmission process performed by a control
unit of the copier;

FIG. 17 is a flowchart for explaining a
remote message key transmission sub-process in the remote
message transmission process of FIG. 16;

25 FIG. 18 is a flowchart for explaining a
self-diagnostic error remote message sub-process in the

1 remote message transmission process of FIG. 16;

FIG. 19 is a flowchart for explaining an advance warning remote message sub-process in the remote message transmission process of FIG. 16;

5 FIG. 20 is a flowchart for explaining a remote message transmission process performed by the control unit of the copier when a request is transmitted to the copier by the CCU;

FIG. 21 is a flowchart for explaining a read sub-process in the remote message transmission process of FIG. 20;

FIG. 22 is a flowchart for explaining a write sub-process in the remote message transmission process of FIG. 20;

15 FIG. 23 is a flowchart for explaining an execute sub-process in the remote message transmission process of FIG. 20;

FIG. 24 is a diagram for explaining a communication sequence of the CCU and the copier during an idle condition;

FIG. 25 is a diagram for explaining a communication sequence of the CCU and the copier during a remote message transmission;

FIG. 26 is a diagram for explaining a communication sequence of the CCU and the copier during a

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1 remote message receiving;

FIG. 27 is a diagram for explaining a communication sequence of the CCU and the copier when an access request is transmitted to the copier;

5 FIG. 28 is a flowchart for explaining a signal line separation message process performed by the copier in a first embodiment of the image forming device management system;

FIG. 29 is a flowchart for explaining a no-communication counter resetting process performed by the copier in the first embodiment;

FIG. 30 is a diagram for explaining a communication sequence of the CCU and the copier when the signal line separation message process utilizes a selecting of the CCU to the copier;

FIG. 31 is a diagram for explaining a communication sequence of the CSS and the copier when the signal line separation message process utilizes a selecting of the CSS to the copier;

20 FIG. 32 is a diagram for explaining a communication sequence of the CCU and the copier when the signal line separation message process utilizes a polling of the CCU to the copier;

FIG. 33 is a diagram for explaining a signal line separation message process utilizing a

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1 detection of a voltage of a terminal of a communication
interface unit of the copier;

FIG. 34 is a flowchart for explaining a
signal line separation message process performed by the
5 copier using a detected voltage of the terminal of the
communication interface unit;

FIG. 35A and FIG. 35B are diagrams for
explaining a signal line separation message process
utilizing a connect detection line between the CCU and the
10 copier;

FIG. 36 is a flowchart for explaining a
signal line separation message process performed by the
copier using a connect detection line between the CCU and
the copier;

15 FIG. 37 is a flowchart for explaining a
first jam detection process performed by the copier in a
second embodiment of the image forming device management
system;

FIG. 38 is a flowchart for explaining a
20 second jam detection process performed by the copier in
the second embodiment;

FIG. 39 is a flowchart for explaining
another second jam detection process performed by the
copier in the second embodiment;

25 FIG. 40 is a flowchart for explaining a CSS

1 function setting process performed by the copier in the
second embodiment;

FIG. 41 is a flowchart for explaining a
maintenance service start/end message process performed by
5 the copier in a third embodiment of the image forming
device management system;

FIG. 42 is a flowchart for explaining
another maintenance service start/end message process
performed by the copier in the third embodiment;

10 FIG. 43 is a flowchart for explaining a
further maintenance service start/end message process
performed by the copier in the third embodiment;

FIG. 44 is a block diagram of a fourth
embodiment of the image forming device management system
15 of the present invention;

FIG. 45 is a block diagram of a data
communication device DCD in the fourth embodiment of the
image forming device management system;

FIG. 46 is a flowchart for explaining a
20 selecting process performed to a particular one of the
image forming devices by the DCD in the fourth embodiment;

FIG. 47 is a flowchart for explaining a
polling process performed to the image forming devices by
the DCD in the fourth embodiment;

25 FIG. 48 is a block diagram of a control

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1 part of an image forming device in the fourth embodiment;

FIG. 49 is a block diagram of a personal interface PI in the control part of the image forming device in the fourth embodiment;

5 FIG. 50 is a schematic diagram of a control panel of the image forming device in the fourth embodiment;

FIG. 51 is a schematic diagram of a character display part in the control panel of the image forming device of FIG. 50;

FIG. 52 is a diagram for explaining a data format of a message transmitted between the CSS and the DCD in the fourth embodiment;

FIG. 53 is a diagram for explaining a data format of a message transmitted between the DCD and the PI in the fourth embodiment;

FIG. 54 is a diagram for explaining a data format of a message transmitted between the PI and the image forming device in the fourth embodiment;

20 FIG. 55 is a diagram for explaining a data format of the message transmitted between the PI and the image forming device in the fourth embodiment;

FIG. 56 is a flowchart for explaining a block billing process performed by the image forming device in the fourth embodiment;

25

1 FIG. 57 is a diagram for explaining a data
format of a message transmitted between the PI and the
image forming device during the block billing process;

5 FIG. 58 is a diagram for explaining another
data format of the message transmitted between the PI and
the image forming device during the block billing process;

 FIG. 59 is a schematic diagram of a user-
program mode indication displayed on the character display
part in the control panel of the image forming device;

10 FIG. 60 is a block diagram of a fifth
embodiment of the image forming device management system
of the present invention;

 FIG. 61 is a diagram for explaining a
parameter code stored in a ROM of an image forming device
15 in the fifth embodiment;

 FIG. 62A and FIG. 62B are diagrams for
explaining respective communication sequences when a read
request and a write request are transmitted to the image
forming device by the CSS;

20 FIG. 63 is a flowchart for explaining a
main control process performed by a control part of the
image forming device when an access request is transmitted
to the image forming device by the CSS;

 FIG. 64 is a flowchart for explaining a
25 read sub-process in the main control process of FIG. 63;

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1 FIG. 65 is a flowchart for explaining a
write sub-process in the main control process of FIG. 63;
FIG. 66 is a schematic diagram of a control
panel of the image forming device in the sixth embodiment;
5 FIG. 67 is a schematic diagram of an image
formation mode indication displayed on a character display
part of the control panel of the image forming device of
FIG. 66;
FIG. 68 is a schematic diagram of a service
10 program mode indication displayed on the character display
part of the control panel of the image forming device of
FIG. 66;
FIG. 69 is a flowchart for explaining a
maintenance service start message process performed by the
15 image forming device in the sixth embodiment when a mode
shift request is output;
FIG. 70 is a flowchart for explaining a
maintenance service end message process performed by the
image forming device in the sixth embodiment;
20 FIG. 71 is a schematic diagram of a
maintenance service start message key displayed on the
character display part of the control panel of the image
forming device of FIG. 66;
FIG. 72 is a flowchart for explaining a
25 maintenance service start message process performed by the

1 image forming device in the sixth embodiment when a mode
shift request is output;

FIG. 73 is a flowchart for explaining a
maintenance service end message process performed by the
5 image forming device in the sixth embodiment; and

FIG. 74A and FIG. 74B are diagrams for
explaining data formats of a maintenance service start
message and a maintenance service end message transmitted
to the CSS by the image forming device.

10

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A description will now be given of the
preferred embodiments of the present invention with
reference to the accompanying drawings.

15 1. FIRST EMBODIMENT

1.1 STRUCTURE OF SYSTEM

FIG. 1 shows a first embodiment of the
image forming device management system of the present
invention. As shown in FIG. 1, in the image forming
20 device management system of the first embodiment, a
plurality of image forming devices 100, such as plain
paper copiers PPC (shown in FIG. 1) or printers (not shown
in FIG. 1), are provided on each of a user site US1 and a
user site US2. It is a matter of course that the image
25 forming device management system of the present invention

1 may include only one image forming device. Hence, the
image forming device management system may include one or
more image forming devices 100 provided therein. For the
sake of convenience, one of the image forming devices 100
5 in the following description will be called the copier
100, unless otherwise specified.

In the image forming device management
system of FIG. 1, a communication control unit CCU 200 is
also provided on each of the user sites US1 and US2, and
10 the plurality of image forming devices 100 of each user
site are connected to the CCU 200. The CCU 200 of each
user site is linked to a central service station CSS 300
at a remote location via a public switched network PSN
250. In the embodiment of FIG. 1, a telephone set 206a is
15 connected to the CCU 200 of the user site US1, and a
facsimile 206b is connected to the CCU 200 of the user
site US2.

The CCU 200 in the first embodiment is, for
example, a communication control device that is capable of
20 being connected up to five image forming devices, and the
interface between each image forming device 100 and the
CCU 200 is provided by a multidrop connection which is in
conformity with RS-485 standard. The communication
sequence between each image forming device 100 and the CCU
25 200 is performed in accordance with basic data

1 transmission procedures. The CCU 200 can communicate with
one of the image forming devices 100 after a data link
between the CCU 200 and the image forming device 100 is
established by using a centralized polling/selecting
5 control method. A specific device address can be set for
each of the image forming devices 100 by setting an
address setting switch (for example, the element 1031 in
FIG. 2) of each image forming device 100, and a polling
address and a selecting address can be set for each image
10 forming device 100 in accordance with the specific device
address.

1.2 STRUCTURE OF IMAGE FORMING DEVICE

1.2.1 MECHANICAL STRUCTURE

The copier 100 in the first embodiment is
15 an analog-type image forming device in which an
electrostatic latent image is formed on a photosensitive
drum when an original image is optically read by a
scanner. In the copier 100, a charger unit, a discharger
unit, a developing unit, a transfer unit, a pre-transfer
20 charger unit, a cleaning unit and a fixing unit, which are
required to perform an electrophotographic process, are
provided around the periphery of the photosensitive drum.
Further, in the copier 100, a sheet supplying device and a
sheet transporting device are provided. Such structure of
25 the copier 100 is known in the prior art, and a detailed

1 description thereof will be omitted.

In a control panel (not shown) of the copier 100, various keys, displays and controls are provided, including a timer key, a timer indicator, a
5 program key, an ENTER key, ten keys, a guidance key, a guidance indicator, a sizing key, a sizing indicator, a centering key, a centering indicator, a paper offset key, a paper offset indicator, a both side indicator, a remote message key, and a remote message indicator. The remote
10 message key and the remote message indicator are related to the present invention and provided within the copier 100. The remote message key and the remote message indicator will be described later. Further, in the control panel of the copier 100, a duplex copy key, a page
15 copy indicator, a page copy indicator, a delete key, a delete indicator, a sheet-designated sizing key, a sheet-designated sizing indicator, a zoom key, a reduce key, an enlarge key, a normal size key, a sheet select key, an auto sheet select key, a density adjust key, an auto
20 density set key, a clear/stop key, a start key, an interrupt key, a preheat indicator, a mode-clear/preheat key, and etc.

1.2.2 ELECTRICAL STRUCTURE

FIG. 2 shows a control part of one of the
25 copiers 100 in the image forming device management system

1 of the first embodiment. As shown in FIG. 2, the copier
100 is controlled by a CPU (central processing unit) 1001.
A control program executed by the CPU 1001 and control
data used for controlling the copier 100 are stored in a
5 ROM (read-only memory) 1002. A RAM (random access memory)
1003 provides a working storage area for the CPU 1001 when
executing the control program. A communication interface
unit 1004 provides an interface between the copier 100 and
the CCU 200 when the copier 100 transmits data to the CCU
10 200 and receives control data and control codes from the
CCU 200.

In the copier 100 of FIG. 2, an A/D
(analog-to-digital) converter 1005 converts various
operating voltages of various sensors 1006 of the copier
15 100 into digital signals, and the digital signals are
supplied to the CPU 1001. A lamp voltage of the scanner,
a light emission voltage and a light receiving voltage of
a P sensor (provided for adjusting a toner density), an
output of an ADS (auto density setting) sensor, an output
20 of a light amount sensor, an output of a current sensor of
the photosensitive drum, and a voltage of a fixing unit
thermistor are supplied to an input of the A/D converter
1005. In the copier 100 of FIG. 2, when a fixing
temperature indicated by the voltage of the fixing unit
25 thermistor is below a given temperature, a copying

1 operation of the copier 100 is inhibited.

In the copier 100 of FIG. 2, an operation
part 1010 includes the above-described keys of the control
panel. The above-mentioned remote message key is provided
5 within the operation part 1010 of the copier 100. The CPU
1001 reads out the settings of the operation part 1010
when a power switch is turned ON. A remote message enable
switch 1032 is provided in the copier 100, and the remote
message enable switch 1032 is connected to the CPU 1001.
10 When the remote message enable switch 1032 is turned ON
during the ON state of the power switch, the CPU 1001
allows the copier 100 to perform a remote message
transmission with respect to the CSS 300. When the remote
message enable switch 1032 is turned OFF, the CPU 1001
15 inhibits the copier 100 from performing the remote message
transmission. Further, the CPU 1001 outputs a control
signal to each of the above-described indicators of the
control panel.

In the copier 100 of FIG. 2, an optical
20 system control unit 1011 is connected to the CPU 1001, and
the optical system control unit 1011 controls an exposure
lamp 1012 of the scanner. A high-voltage supply unit 1013
is connected to the CPU 1001, and the high-voltage supply
unit 1013 supplies a high voltage to each of load
25 resistors of various elements 1014 including the charger

1 unit, the discharger unit, the transfer charger unit, the
developing unit, and the PTC (pre-transfer charger) unit.
A motor control unit 1015 is connected to the CPU 1001,
and the motor control unit 1015 controls a main motor
5 1016. A heater control unit 1017 is connected to the CPU
1001, and the heater control unit 1017 controls a fixing
heater 1018 of the fixing unit. A sensor control unit
1021 is connected to the CPU 1001, and the sensor control
unit 1021 controls various sensors 1022. Specifically,
10 the sensor control unit 1021 controls a light receiving
gain of each of the light amount sensor, the ADS sensor
and the P sensor, and controls a light emission voltage of
the P sensor.

1.3 COMMUNICATION CONTROL UNIT

15 FIG. 3 shows the CCU 200 in the image
forming device management system of the first embodiment.
As shown in FIG. 3, the CCU 200 is controlled by a CPU 201
similar to the copier 100. A control program executed by
the CPU 201 and control data used for controlling the CCU
20 200 are stored in a ROM 202. A RAM 203 provides a working
storage area for the CPU 201 when executing the control
program. A battery 203a is connected to the RAM 203, and
the battery 203a serves to allow the RAM 203 to retain
intermediate results of the execution of the control
25 program even after a power switch is turned OFF.

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1 Further, in the CCU 200 of FIG. 3, a
switching device 207 is connected to the CPU 201, and the
switching device 207 selects one of a connection of the
telephone set 206a (or the facsimile 206b) and the PSN 250
5 and a connection of the CCU 200 and the PSN 250. Either
the telephone set 206a or the facsimile 206b may be
connected through the switching device 207 to the CCU 200.
A modem 204 is connected to the CPU 201 and the switching
device 207, and the modem 204 provides a communication
10 interface between the CCU 200 and the PSN 250 when the
copier 100 transmits data to the CSS 300 via the PSN 250
and receives control data and control codes from the CSS
300 via the PSN 250. An RS-485 interface unit 205
provides the data transmission interface between the
15 copier 100 and the CCU 200 which is in conformity with RS-
485 standard. Further, in the CCU 200 of FIG. 3, a total
counter value transmission enable switch 208 and a clock
209 are provided.

The CCU 200 receives data supplied by the
20 copier 100, and transmits the data through the PSN 250 to
the CSS 300. Further, the CCU 200 receives control codes
and control data supplied by the CSS 300, and transmits
them to the copier 100. The CCU 200 sends a control
signal to the high-voltage supply unit 1013 of the copier
25 100 so as to control the ON/OFF of the power switch of the

1 copier 100. The CCU 200 recognizes the identification of
each of the copiers 100 which are connected the CCU 200
within the same user site. The CCU 200 deals with the
remote message transmission of each of the copiers 100
5 connected to the CCU 200 within the same user site. The
switching device 207 in the CCU 200 selects one of the
connection of the telephone set 206a (or the facsimile
206b) and the PSN 250 and the connection of the CCU 200
and the PSN 250.

10 1.4 CENTRAL SERVICE STATION

FIG. 4 shows the CSS 300 in the image
forming device management system of the first embodiment.
As shown in FIG. 4, the CSS 300 includes a host computer
301 which performs various management processes. A
15 storage device 302 is connected to the host computer 301,
and stores management data which is used by the host
computer 301 when performing the management processes. A
modem 303 is connected to the host computer 301, and
provides a communication interface between the host
20 computer 301 and the PSN 250 when the copier 100 transmits
data to the CSS 300 via the PSN 250 and receives control
data and control codes from the CSS 300 via the PSN 250.
Further, in the CSS 300 of FIG. 4, a display monitor 304,
a keyboard 305 and a printer 306 are provided.

25 1.5 COMMUNICATION SEQUENCES

1 FIG. 5 shows a communication sequence of
the remote message transmission when the remote message
key is turned ON. When the remote message key, provided
in the operation part 1010 of the copier 100, is turned
5 ON, the copier 100 transmits a remote message key
transmission message to the CCU 200, as shown in FIG. 5.
The remote message key transmission message sent by the
copier 100 is received by the CCU 200, and the CCU 200
originates a call to a predetermined telephone number of
10 the CSS 300 via the PSN 250. When a data link between the
CCU 200 and the CSS 300 is established, the CCU 200
transmits a remote message key transmission message to the
CSS 300 via the PSN 250. The CSS 300 is usually installed
at a service location remote from the user site. The
15 message sent at this time to the CSS 300 by the CCU 200 is
one of various kinds of messages sent to the CSS 300 by
the CCU 200, and includes only data of preset parameters
of the CCU 200 contained in the remote message key
transmission message. The parameters of the CCU 200 can
20 be set or rewritten by the CSS 300 through a data
transmission from the CSS 300 to the CCU 200 via the PSN
250.

 When the transmission of the message from
the CCU 200 to the CSS 300 is performed, the CCU 200
25 transmits a transmission result to the copier 100 which is

1 the originating station, the transmission result
indicating a result of the transmission between the CCU
200 and the CSS 300. By receiving the transmission result
sent by the CCU 200, the copier 100 is informed as to
5 whether the transmission of the message normally ends or
abnormally ends.

The copier 100 generally has a self-
diagnostic function. For example, when an error of the
fixing temperature or an error of adjustment controls in
10 the copier 100 is detected as a result of the self-
diagnostic testing, an error message or a serviceman call
message is displayed in the copier 100.

FIG. 6 shows a communication sequence of
the remote message transmission when a self-diagnostic
error takes place. When a self-diagnostic (S/D) error is
15 detected as a result of the S/D testing of the copier 100,
the copier 100 transmits an S/D error remote message to
the CCU 200, as shown in FIG. 6. The S/D error remote
message sent by the copier 100 is received by the CCU 200,
20 and the CCU 200 originates a call to a predetermined
telephone number of the CSS 300 via the PSN 250. When a
data link between the CCU 200 and the CSS 300 is
established, the CCU 200 transmits an S/D error remote
message to the CSS 300 via the PSN 250. When the
25 transmission of the message from the CCU 200 to the CSS

1 300 is performed, the CCU 200 transmits a transmission
result to the copier 100 which is the originating station,
the transmission result indicating a result of the
transmission between the CCU 200 and the CSS 300. By
5 receiving the transmission result sent by the CCU 200, the
copier 100 is informed as to whether the transmission of
the message normally ends or abnormally ends.

The copier 100 generally has an advance
warning function. For example, when no significant error
10 is detected as a result of the self-diagnostic testing but
the copier 100 determines that the copier 100 requires a
maintenance service, an advance warning remote message is
transmitted to the CSS 300 by the copier 100.

FIG. 7 shows a communication sequence of
15 the remote message transmission when an advance warning
remote message is transmitted. As shown in FIG. 7, the
copier 100 transmits an advance warning remote message to
the CCU 200. The advance warning remote message sent by
the copier 100 is received by the CCU 200, and the CCU 200
20 originates a call to a predetermined telephone number of
the CSS 300 via the PSN 250. When a data link between the
CCU 200 and the CSS 300 is established, the CCU 200
transmits an advance warning remote message to the CSS 300
via the PSN 250. The CCU 200 in this case does not
25 transmit a transmission result to the copier 100 (or the

1 originating station) when the transmission of the message
from the CCU 200 to the CSS 300 is performed.

When the S/D error remote message is sent
to the CCU 200, the copier 100 in the first embodiment
5 does not work. When the advance warning remote message is
sent to the CCU 200, the copier 100 in the first
embodiment is workable. Even during the transmission of
the advance warning remote message, the copier 100 starts
performing the copying operation if an original document
10 is placed on the copier 100 and the start key is turned
ON. However, when the load on the control part of the
copier 100 will be excessively high if the copying
operation is performed, the transmission of the advance
warning remote message may be interrupted.

15 Generally, the degree of emergency for the
advance warning remote message is lower than that for the
A/D error remote message. It is possible to defer the
transmission of the advance warning remote message from
the CCU 200 to the CSS 300 until the frequency of use of
20 the telephone set 206a or the facsimile 206b is kept at an
adequately low level or until the traffic of the PSN 250
is kept at an adequately low level. The deferred time of
the transmission of the message can be set by the CSS 300
through the communication between the CSS 300 and the CCU
25 200 via the PSN 250.

1 FIG. 8A, FIG. 8B and FIG. 8C show
respective communication sequences when a read request, a
write request and an execute request are transmitted to
the copier 100 by the CSS 300.

5 The communication sequence of FIG. 8A is
performed when a read request is transmitted to the copier
100 by the CSS 300. The read request is issued by the CSS
300 in order to read logging data of the copier 100, the
settings of the parameters of the copier 100 or the
10 outputs of the sensors of the copier 100. The
communication sequence of FIG. 8B is performed when a
write request is transmitted to the copier 100 by the CSS
300. The write request is issued by the CSS 300 in order
to transmit new data from the CSS 300 to the copier 100
15 and write the new data to the parameters of the copier
100. The communication sequence of FIG. 8C is performed
when an execute request is transmitted to the copier 100
by the CSS 300. The execute request is issued by the CSS
300 in order to have the copier 100 perform a testing
20 operation.

 In each of the communication sequences of
FIG. 8A through FIG. 8C, the CSS 300 originates a call to
a predetermined telephone number of the CCU 200 via the
PSN 250. When a data link between the CCU 200 and the CSS
25 300 is established, the CSS 300 transmits a request to the

1 CSS 300 via the PSN 250. The request sent by the CSS 300
includes an identification of a designation copier 100 to
which the request is made by the CSS 300. When the
request from the CSS 300 is received by the CCU 200, the
5 CCU 200 transmits the request to the designation copier
100. When the request from the CCU 200 is received by the
designation copier 100, the designation copier 100
processes the request and transmits a response to the
request to the CCU 200. When the response from the
10 designation copier 100 is received by the CCU 200, the CCU
200 transmits the response to the CSS 300 via the PSN 250.
In this manner, the communication sequence for each
request sent to the copier 100 by the CSS 300 is performed
by the image forming device management system of the first
15 embodiment.

FIG. 9A, FIG. 9B and FIG. 9C show
respective communication sequences when a read request, a
write request and an execute request are transmitted to
the CCU 200 by the CSS 300.

20 The communication sequence of FIG. 9A is
performed when a read request is transmitted to the CCU
200 by the CSS 300. The read request is issued by the CSS
300 in order to read the settings of the parameters of the
CCU 200 or the status of the CCU 200. Alternatively, the
25 read request is issued by the CSS 300 in order to read the

1 internal data of the copier 100 previously read by the CCU
200. The communication sequence of FIG. 9B is performed
when a write request is transmitted to the CCU 200 by the
CSS 300. The write request is issued by the CSS 300 in
5 order to transmit new data from the CSS 300 to the CCU 200
and write the new data to the parameters of the CCU 200.
The communication sequence of FIG. 9C is performed when an
execute request is transmitted to the CCU 200 by the CSS
300. The execute request is issued by the CSS 300 in
10 order to have the CCU 200 perform a testing operation.

In each of the communication sequences of
FIG. 9A through FIG. 9C, the CSS 300 originates a call to
a predetermined telephone number of the CCU 200 via the
PSN 250. When a data link between the CCU 200 and the CSS
15 300 is established, the CSS 300 transmits a request to the
CSS 300 via the PSN 250. When the request from the CSS
300 is received by the CCU 200, the CCU 200 processes the
request and transmits a response to the request to the CSS
300. In this manner, the communication sequence for each
20 request sent to the CCU 200 by the CSS 300 is performed by
the image forming device management system of the first
embodiment.

FIG. 10 shows a communication sequence when
a read request is transmitted to the copier 100 by the CCU
25 200.

1 The communication sequence of FIG. 10 is
performed when a read request is transmitted to the copier
100 by the CCU 200. The read request is issued by the CCU
200 regardless of the CSS 300, in order to read the
5 logging data of the copier 100, the settings of the
parameters of the copier 100 or the outputs of the sensors
of the copier 100. In the communication sequence of FIG.
10, the CCU 200 transmits a read request to the copier
100. When the read request from the CCU 200 is received
10 by the copier 100, the copier 100 processes the request
and transmits a response to the request to the CCU 200.
In this manner, the data of the copier 100 is read by the
CCU 200. Further, the data of the copier 100 previously
read by the CCU 200 is read by the CSS 300 by performing
15 the communication sequence of FIG. 9A.

FIG. 11 shows various parameters which are
set in the CCU 200 in the image forming device management
system of the first embodiment. Suppose that device
addresses 1 through 5 are assigned to the image forming
20 devices 100 (or the copiers 100) in the image forming
device management system of FIG. 1.

As shown in FIG. 11, the parameters, set in
the CCU 200 are grouped into six blocks, including an
image forming device block, a remote message key
25 transmission block, an S/D error remote message block, an

1 advance warning remote message block, a total counter
value transmission block, and a telephone setting block.
In the image forming device block, a model number and a
serial number are retained with respect to each of the
5 respective copiers 100. When a message is transmitted
from a particular one of the copiers 100 to the CCU 200,
the CCU 200 adds the model number and serial number (or
the parameters corresponding to that copier 100) to the
message as the identification of that copier 100, and
10 transmits the message, including the identification of the
copier 100, to the CSS 300. When an access request,
including an identification of a destination copier 100,
is transmitted to the CCU 200 by the CSS 300, the CCU 200
selects a particular one of the copiers 100 by the
15 identification of the copier included in the request, and
transmits the request to the selected one of the copiers
100.

With respect to each of the remote message
key transmission block, the S/D error remote message block
20 and the advance warning remote message block, a
destination telephone number, the number of redials, a
redial period, and conditions of data transmission to the
CSS 300 in the remote message transmission are retained in
the CCU 200 as shown in FIG. 11. In addition, in the
25 advance warning remote message block, a notification time

1 (at which a remote message is transmitted to the CSS 300)
is further retained in the CCU 200.

Further, in the total counter value
transmission process block in the parameters of the CCU
5 200, a total counter value collection time, a destination
telephone number, and transmission date and time are
retained as shown in FIG. 11. In the telephone setting
block, a dial mode setting (a dial pulse or a dial tone),
and a dial pulse period setting are retained. Further,
10 with respect to each of the respective blocks in the
parameters of the CCU 200, a check sum is provided for an
error detection. The parameters of the CCU 200 can be set
or rewritten by the CSS 300 through a data transmission
from the CSS 300 to the CCU 200 via the PSN 250.
15 Alternatively, a portable special device for parameter
setting may be connected to the CCU 200 so as to set or
rewrite the parameters of the CCU 200 by using the special
device. In the image forming device management system of
the present invention, a total counter of the copier 100
20 is usually non-resettable, and the total counter value
output by the total counter is an accumulated value
incremented from an initial value, and indicates a total
of copy sheets for which image formation is performed by
the copier 100.

25 1.6 DATA FORMAT OF MESSAGES

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1 FIG. 12A, FIG. 12B and FIG. 12C show data
formats of messages when a remote message transmission is
performed.

5 FIG. 12A shows a data format of a remote
message sent from the copier 100 to the CCU 200. As shown
in FIG. 12A, the remote message includes a message code in
the first field, and the number of jams, the number of
self-diagnostic (S/D) errors, the number of copy sheets
and a state of the copier in the subsequent fields. The
10 message code in the first field indicates which of a
remote message key transmission, an S/D error remote
message transmission and an advance warning remote message
transmission is related to that remote message. The state
of the copier in the final field indicates various states
15 of the copier, including a lack of a replenishment part,
such as toner, oil or paper, an output of a certain
sensor, a setting of an adjustment point, and a state of
connection of the copier elements.

20 FIG. 12B shows a data format of a remote
message sent from the CCU 200 to the CSS 300. As shown in
FIG. 12B, the remote message includes a model number and
serial number in the first field, and the message code,
the number of S/D errors, the state of the copier and an
occurrence time in the subsequent fields. The model
25 number and the serial number in the first field are

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1 specific to the originating copier 100. The message code,
the number of jams, the number of S/D errors, the number
of copy sheets, and the state of the copier in the
subsequent fields are the same as those of the message
5 sent from the copier 100. The occurrence time in the
final field indicates a time the remote message is
produced, and this time is output by the clock 209 of the
CCU 200. The contents of the subsequent fields (except
the final field) of the remote message sent from the CCU
10 200 to the CSS 300 may vary according to the parameters of
the CCU 200. In the example of FIG. 12B, the parameters
of the CCU 200 are set such that the remote message
includes only the message code, the number of the S/D
errors and the state of the copier.

15 FIG. 12C shows a data format of a response
sent from the CCU 200 to the copier 100. As shown in FIG.
12C, the response includes a response code in the first
field and the contents of the response in the final field.

FIG. 13A, FIG. 13B and FIG. 13C show
20 respective data formats of messages when an access request
is transmitted to the copier 100 (or the destination
copier 100) by the CSS 300.

FIG. 13A shows respective data formats of
each of a read request sent from the CSS 300 to the CCU
25 200, a read request sent from the CCU 200 to the copier

1 100, a response sent from the copier 100 to the CCU 200,
and a response sent from the CCU 200 to the CSS 300. As
shown in FIG. 13A, the read request, sent to the CCU 200
by the CSS 300, includes a model number and serial number
5 in the first field, and a read request code and an item
code in the subsequent fields. The model number and the
serial number in the first field of this message indicates
an identification of the copier 100 which is to be
accessed by the CSS 300 by the read request. The read
10 request, sent to the copier 100 by the CCU 200, includes
the read request code in the first field and the item code
in the second field, which are the same as corresponding
ones of the read request sent to the CCU 200 by the CSS
300.

15 Further, as shown in FIG. 13A, the
response, sent to the CCU 200 by the copier 100, includes
a read response code in the first field, and an item code
and a read data in the subsequent fields. The read data
in the final field of this message indicates the result in
20 response to the access request made by the CSS 300. The
response, sent to the CSS 300 by the CCU 200, includes the
model number and the serial number in the first field, and
the read response code, the item code and the read data in
the subsequent fields. The model number and the serial
25 number in the first field of this message indicate the

1 identification of the copier 100.

FIG. 13B shows respective data formats of
each of a write request sent from the CSS 300 to the CCU
200, a write request sent from the CCU 200 to the copier
5 100, a response sent from the copier 100 to the CCU 200
and a response sent from the CCU 200 to the CSS 300. As
shown in FIG. 13B, the messages in the write request case
are essentially the same as corresponding messages in the
read request case of FIG. 13A except for the following
10 points. Both the write request sent to the CCU 200 by the
CSS 300 and the write request sent to the copier 100 by
the CCU 200 additionally include a writing data in the
respective final fields. Both the response sent to the
CCU 200 by the copier 100 and the response sent to the CSS
15 300 by the CCU 200 include the written data in the
respective final fields instead of the read data in the
response of FIG. 13A. Usually, the written data of the
response sent by the copier 100 is the same as the writing
data of the write request sent by the CSS 300. However,
20 when the writing data received from the CSS 300 is out of
an effective data range of the copier 100, the written
data of the response sent by the copier 100 may be rounded
within the effective data range.

FIG. 13C shows respective data formats of
25 each of an execute request sent from the CSS 300 to the

1 CCU 200, an execute request sent from the CCU 200 to the
copier 100, a response sent from the copier 100 to the CCU
200 and a response sent from the CCU 200 to the CSS 300.
As shown in FIG. 13C, the messages in the execute request
5 case are essentially the same as corresponding messages in
the read request case of FIG. 13A except for the following
points. Both the execute request sent to the CCU 200 by
the CSS 300 and the execute request sent to the copier 100
by the CCU 200 additionally include a subsidiary parameter
10 in the respective final fields. The subsidiary parameter
indicates a supplementary command parameter of the execute
request other than the item code. Both the response sent
to the CCU 200 by the copier 100 and the response sent to
the CSS 300 by the CCU 200 include the execution result in
15 the respective final fields instead of the read data in
the responses of FIG. 13A.

FIG. 14A, FIG. 14B and FIG. 14C show data
formats of messages when an access request is transmitted
to the CCU 200 by the CSS 300.

20 As shown in FIG. 14A through FIG. 14C, the
messages in the CSS-to-CCU access request case are
essentially the same as corresponding messages in the CSS-
to-copier access request case of FIG. 13A through FIG. 13C
except for the following points. Both the access requests
25 sent to the CCU 200 by the CSS 300 and the responses sent

1 to the CSS 300 by the CCU 200 include a CCU device code in
the respective first fields as an identification of the
CCU 200 instead of the identification (or the model number
and the serial number) of the copier 100 in the CSS-to-
5 copier access request case of FIG. 13A through FIG. 13C.

FIG. 15A and FIG. 15B show data formats of
messages when a read request is transmitted to the copier
100 by the CCU 200.

As shown in FIG. 15A, the read request sent
10 to the copier 100 by the CCU 200 in the CCU-to-copier case
is the same as the corresponding message in the CSS-to-
copier read request case of FIG. 13A. As shown in FIG.
15B, the response sent to the CCU 200 by the copier 100 in
the CCU-to-copier case is the same as the corresponding
15 message in the CSS-to-copier response case of FIG. 13A.
Hence, the copier 100 deals with the messages in the same
manner for both the CCU-to-copier read access case and the
CSS-to-copier read access case.

1. 7 REMOTE MESSAGE TRANSMISSION PROCESS

20 1.7.1 REMOTE MESSAGE TRANSMISSION PROCESS BY COPIER

Next, a description will be given of a
remote message transmission process performed by the
copier 100 in the first embodiment, with reference to FIG.
16 through FIG. 19.

25 FIG. 16 shows a remote message transmission

1 process performed by the CPU 1001 of the copier 100 of
FIG. 1 in the first embodiment. As shown in FIG. 16, at
the start of the remote message transmission process, the
CPU 1001 of the copier 100 at step S1 determines whether
5 the remote message (R/M) enable switch 1032 (FIG. 2) is in
its ON state.

When the result at the step S1 is
affirmative, the CPU 1001 at step S2 determines whether
the remote message key of the operation part 1010 (FIG. 2)
10 is in its ON state. Otherwise, the remote message
transmission process of FIG. 16 at the present cycle ends.

When the result at the step S2 is
affirmative, the CPU 1001 at step S3 performs a remote
message (R/M) key transmission sub-process. The control
15 of the CPU 1001 is transferred to a start of the R/M key
transmission sub-process shown in FIG. 17, which will be
described below.

When the result at the step S2 is negative,
the CPU 1001 at step S4 determines whether a self-
20 diagnostic (S/D) error has occurred. When the result at
the step S4 is affirmative, the CPU 1001 at step S5
performs a self-diagnostic (S/D) error remote message sub-
process. The control of the CPU 1001 is transferred to a
start of the S/D error remote message sub-process shown in
25 FIG. 18, which will be described below.

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1 time-out timer is reset to zero), the CPU 1001 at step S14
determines whether a response message sent by the CCU 200
in reply to the R/M key remote message has been received
by the copier 100. The CPU 1001 at step S15 determines
5 whether the time-out timer exceeds a given waiting period
(for example, three minutes).

When the result at the step S15 is
affirmative (the time-out timer exceeds three minutes),
the CPU 1001 performs the above step S16 (in which the
10 transmission error message is displayed). Otherwise the
CPU repeats the above step S14.

When the result at the step S14 is
affirmative (or the response message of the CCU 200 is
received), the CPU 1001 at step S17 determines whether the
15 response message of the CCU 200 indicates an
acknowledgement of receipt of the remote message sent to
the CCU 200 by the copier 100.

When the result at the step S17 is
negative, the CPU 1001 performs the above step S16 (or the
20 transmission error message is displayed on the operation
part 1010). On the other hand, when the result at the
step S17 is affirmative, the CPU 1001 at step S18 displays
a transmission end message for the transmitted remote
message on the operation part 1010. After the step S18 is
25 performed, the R/M key transmission sub-process ends.

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1 FIG. 18 shows a self-diagnostic (S/D) error
remote message sub-process in the remote message
transmission process of FIG. 16.

5 As shown in FIG. 18, at the start of the
S/D error remote message sub-process, the CPU 1001 at step
S21 transmits a remote message to the CCU 200 in response
to the self-diagnostic error having occurred. After the
step S21 is performed, the CPU 1001 at step S22 determines
whether an end-of-transmission (EOT) signal from the CCU
10 200 is normally received by the copier 100.

When the result at the step S22 is
affirmative, the CPU 1001 at step S23 resets a time-out
timer to zero. Otherwise the CPU 1001 at step S26
displays a transmission error message on the operation
15 part 1010 and does not perform the step S23.

After the step S23 is performed (or the
time-out timer is reset to zero), the CPU 1001 at step S24
determines whether a response message sent by the CCU 200
in reply to the S/D error remote message has been received
20 by the copier 100. The CPU 100 at step S25 determines
whether the time-out timer exceeds a given waiting period
(for example, twenty minutes).

When the result at the step S25 is
affirmative (the time-out timer exceeds twenty minutes),
25 the CPU 1001 performs the above-mentioned step S26 (in

1 which the transmission error message is displayed).
Otherwise the CPU repeats the step S24.

 When the result at the step S24 is
affirmative (or the response of the CCU 200 is received),
5 the CPU 1001 at step S27 determines whether the response
message of the CCU 200 indicates an acknowledgement of
receipt of the remote message sent by the copier 100.

 When the result at the step S27 is
negative, the CPU 1001 performs the above step S26 (or the
10 transmission error message is displayed on the operation
part 1010). On the other hand, when the result at the
step S27 is affirmative, the CPU 1001 at step S28 displays
a transmission end message for the transmitted remote
message on the operation part 1010. After the step S28 is
15 performed, the A/W remote message sub-process ends.

FIG. 19 shows an advance warning (A/W)
remote message sub-process in the remote message
transmission process of FIG. 16.

 As shown in FIG. 19, at the start of the
20 A/W remote message sub-process, the CPU 1001 at step S31
transmits a remote message to the CCU 200 in response to
the advance warning. After the step S31 is performed, the
A/W remote message sub-process of FIG. 19 ends.

1.7.2 ACCESS REQUEST FROM CCU TO COPIER

25 A description will be given of a remote

1 message transmission process performed by the copier 100
when an access request is transmitted to the copier 100.

FIG. 20 shows a remote message transmission
process performed by the copier 100 when an access request
5 is sent to the copier 100 by the CCU 200.

As shown in FIG. 20, at the start of the
remote message transmission process, the CPU 1001 of the
copier 100 at step S41 determines whether the remote
message enable switch 1032 (FIG. 2) is in its ON state.

10 When the result at the step S41 is
affirmative (or the switch 1032 is in the ON state), the
CPU 1001 at step S42 determines whether the communication
interface unit 1004 contains an access request sent to the
copier 100 by the CCU 200. Otherwise the CPU 1001 ends
15 the remote message transmission process of FIG. 20 and
does not perform the step S42.

When the result at the step S42 is
affirmative, the CPU 1001 at step S43 receives the access
request contained in the communication interface unit
20 1004. After the step S43 is performed, the CPU 1001 at
step S44 determines whether the received access request is
a read request sent to the copier 100 by the CCU 200.

When the result at the step S44 is
affirmative, the CPU 1001 at step S45 performs a read sub-
25 process. The control of the CPU 1001 is transferred to a

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1 start of the read sub-process shown in FIG. 21, which will
be described below.

When the result at the step S44 is
negative, the CPU 1001 at step S46 determines whether the
5 received access request is a write request sent to the
copier 100 by the CCU 200.

When the result at the step S46 is
affirmative, the CPU 1001 at step S47 performs a write
sub-process. The control of the CPU 1001 is transferred
10 to a start of the write sub-process shown in FIG. 22,
which will be described below.

When the result at the step S46 is
negative, the CPU 1001 at step S48 determines whether the
received access request is an execute request sent to the
15 copier 100 by the CCU 200.

When the result at the step S48 is
affirmative, the CPU 1001 at step S49 performs an execute
sub-process. The control of the CPU 1001 is transferred
to a start of the execute sub-process shown in FIG. 23,
20 which will be described below. Otherwise it is determined
that the received access request does not match any
request code, and the CPU 1001 at step S50 transmits an
error code from the copier 100 to the CCU 200. After the
step S50 is performed, the remote message transmission
25 process of FIG. 20 at the present cycle ends.

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1 FIG. 21 shows a read sub-process in the
remote message transmission process of FIG. 20.

 As shown in FIG. 21, at the start of the
read sub-process, the CPU 1001 at step S51 determines
5 whether the item code of the received request correctly
matches a predetermined code. When the result at the step
S51 is affirmative, the CPU 1001 at step S52 transmits a
response to the received request to the CCU 200. On the
other hand, when the result at the step S51 is negative,
10 it is determined that the item code of the received
request does not match the predetermined code, and the CPU
1001 at step S53 transmits an error code to the CCU 200.

 After the step S52 or the step S53 is
performed, the read sub-process at the present cycle ends.

15 FIG. 22 shows a write sub-process in the
remote message transmission process of FIG. 20.

 As shown in FIG. 22, at the start of the
write sub-process, the CPU 1001 at step S61 determines
whether the item code of the received write request
20 correctly matches a predetermined code. When the result
at the step S61 is affirmative, the CPU 1001 at step S62
determines whether the writing data of the received write
request is in an effective data range of the copier 100.

 When the result at the step S62 is
25 affirmative, the CPU 1001 at step S63 writes the writing

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1 data of the received write request to the copier 100.
After the step S63 is performed, the CPU 1001 at step S64
transmits a response, including the written data, to the
CCU 200. After the step S64 is performed, the CPU 1001
5 ends the write sub-process of FIG. 22.

When the result at the step S62 is
negative, the CPU 1001 at step S65 determines whether the
writing data of the received write request can be rounded
within the effective data range of the copier 100.

10 When the result at the step S65 is
affirmative, the CPU 1001 at step S66 writes the rounded
writing data to the copier 100. After the step S66 is
performed, the CPU 1001 performs the above step S64. On
the other hand, when the result at the step S65 is
15 negative, the CPU 1001 at step S67 transmits an error code
to the CCU 200. After the step S67 is performed, the CUP
1001 ends the write sub-process of FIG. 22.

FIG. 23 shows an execute sub-process in the
remote message transmission process of FIG. 20.

20 As shown in FIG. 23, at the start of the
execute sub-process, the CPU 1001 at step S71 determines
whether the item code of the received execute request
correctly matches a predetermined code. When the result
at the step S71 is negative, the CPU 1001 at step S76
25 transmits an error code to the CCU 200. On the other

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1 hand, when the result at the step S71 is affirmative, the
CPU 1001 at step S72 determines whether the received
execute request needs a subsidiary parameter.

When the result at the step S72 is
5 negative, the CPU 1001 at step S73 executes an operation
on the copier 100 in accordance with the received execute
request. After the step S73 is performed, the CPU 1001 at
step S74 transmits a response, including the execution
result, to the CCU 200 from the copier 100. After the
10 step S74 is performed, the CPU 1001 ends the execute sub-
process of FIG. 23.

When the result at the step S72 is
affirmative, the CPU 1001 at step S75 determines whether
the subsidiary parameter of the received request is in an
15 effective range of the copier 100.

When the result at the step S75 is
affirmative, the CPU 1001 performs the above steps S73 and
S74. On the other hand, when the result at the step S75
is negative, the CPU 1001 performs the above step S76 in
20 which an error code is transmitted to the CCU 200. After
the step S76 is performed, the CPU 1001 ends the execute
sub-process of FIG. 23.

1.7.3 COMMUNICATION SEQUENCES OF CCU AND COPIER

FIG. 24 shows a communication sequence of
25 the CCU 200 and the copier 100 during an idle condition.

1 Suppose that the five copiers 100 are connected to the CCU
200, and the copiers 100 and the CCU 200 are in the idle
condition.

As shown in FIG. 24, a polling (ENQ) of the
5 CCU 100 to a specific one of the copiers 100 is
sequentially performed for all the copiers 100 by using a
polling address of the specific one of the copiers 100.
If there is no message which should be transmitted to the
CCU 200, each of the copiers 100 sends back a negative
10 acknowledgement (EOT) to the CCU 200 in response to the
polling. If the EOT signal is received from all the
copiers 100, the CCU 200 repeats the polling process.

FIG. 25 shows a communication sequence of
the CCU 200 and the copier 100 during a remote message
15 transmission. Suppose that there is a remote message
which should be transmitted from the copier#2 100 to the
CCU 200, and the copier#2 100 has a polling address "2".

As shown in FIG. 25, after the polling
(P2ENQ) of the CCU 200 to the copier#2 is performed by
20 using the polling address "2", the copier#2 transmits the
message through the RS-485 interface 205 to the CCU 200.
After the transmission of the message, the CCU 200
transmits an acknowledgment (ACK) to the copier#2 at the
polling address "2". After the ACK signal is received,
25 the copier#2 transmits the EOT signal to the CCU 200.

1 FIG. 26 shows a communication sequence of
the CCU 200 and the copier 100 during a remote message
receiving. Suppose that there is a transmission result
message which should be transmitted from the CCU 200 to
5 the copier#5 100, and the copier#5 100 has a selecting
address "5".

 As shown in FIG. 26, after the polling
process for all the copiers 100 is terminated by the CCU
200, a selecting (P5ENQ) of the CCU 200 to the copier#5
10 100 is performed by using the selecting address "5".
After the selecting is performed, the copier#5 100 at the
selecting address "5" transmits an acknowledgement (ACK)
to the CCU 200. The CCU 200 transmits the transmission
result message through the RS-485 interface 205 to the
15 copier#5 100 at the selecting address "5". After the
transmission of the message, the copier#5 100 at the
selecting address "5" transmits an acknowledgment (ACK) to
the CCU 200. After the ACK signal is received, the CCU
200 transmits the EOT signal to the copier#5 100 at the
20 selecting address "5". Then, the control of the CCU 200
is transferred to the polling process.

 FIG. 27 shows a communication sequence of
the CCU 200 and the copier 100 when an access request is
transmitted to the copier 100 by the CCU 200 (or by the
25 CSS 300). Suppose that the access request is transmitted

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1 to the copier#3 100 by the CCU 200 or the CSS 300, and the
copier#3 100 has a selecting address "3".

As shown in FIG. 27, after the selecting
(P3ENQ) of the CCU 200 to the copier#3 100 is performed by
5 using the selecting address "3", the copier#3 100 at the
selecting address "3" transmits an acknowledgement (ACK)
to the CCU 200. The CCU 200 transmits the access request
(which is one of a read request, a write request and an
execute request) through the RS-485 interface 205 to the
10 copier#3 100 at the selecting address "3". After the
transmission of the access request, the copier#3 100 at
the selecting address "3" transmits an acknowledgment
(ACK) to the CCU 200. After the ACK signal is received,
the CCU 200 transmits the EOT signal to the copier#3 100
15 at the selecting address "3". Then, the control of the
CCU 200 is transferred to the polling process for the
copier#3 100 at the address "3".

1.8 SIGNAL LINE SEPARATION MESSAGE PROCESS

1.8.1 NO-COMMUNICATION COUNTER METHOD

20 FIG. 28 shows a signal line separation
message process performed by the copier 100 in a first
embodiment of the image forming device management system
of the present invention. The signal line separation
message process of FIG. 28 utilizes a no-communication
25 (N/C) counter in the CPU 1001 of the copier 100.

1 In the present embodiment, the polling of
the CSS 300 for the copiers 100 is periodically performed.
The period of performing the polling process is, for
example, once for 24 hours or less. Further, in the
5 present embodiment, the signal line separation message
process of FIG. 28 is periodically initiated by the CPU
1001 by using a timer.

As shown in FIG. 28, the CPU 1001 at step
S101 determines whether a message display flag is set to
10 "1" (or ON state). When the result at the step S101 is
affirmative, the CPU 101 at step S103 determines whether
the N/C counter is larger than a given value.

On the other hand, when the result at the
step S101 is negative, the CPU 101 at step S102 increments
15 the N/C counter. After the step S102 is performed, the
CPU 101 performs the above step S103.

When the result at the step S103 is
affirmative (or the N/C counter > the given value), the
CPU 1001 at step S104 displays a signal line separation
20 message on the operation part 1010. The signal line
separation message indicates to the user of the copier 100
that a separation of the signal line between the CCU 200
and the copier 100 occurs. After the step S104 is
performed, the CPU 1001 at step S105 sets the message
25 display flag to "1". After the step S105 is performed,

1 the signal line separation message process of FIG. 28
ends.

On the other hand, when the result at the
step S103 is negative (or the N/C counter < the given
5 value), the CPU 1001 at step S106 determines whether the
message display flag is set to "1". When the result at
the step S106 is affirmative, the CPU 101 at step S107
eliminates the signal line separation message from the
operation part 1010. After the step S107 is performed,
10 the CPU 1001 at step S108 resets the message display flag
to "0" (or OFF state). After the step S108 is performed,
the signal line separation message process of FIG. 28
ends.

On the other hand, when the result at the
15 step S106 is negative, the CPU 101 ends the signal line
separation message process of FIG. 28 and does not
perform the above steps S107 and S108.

FIG. 29 shows a no-communication counter
resetting process performed by the copier 100 in the first
20 embodiment. In the present embodiment, the no-
communication counter resetting process of FIG. 29 is
periodically initiated by the CPU 1001 by using a timer.

As shown in FIG. 29, the CPU 1001 at step
S201 determines whether data sent from the CSS 300 or the
25 CCU 200 is received by the communication interface unit

1 1004. When the result at the step S201 is affirmative,
the CPU 1001 at step S202 resets the N/C counter to "0".
After the step S202 is performed, the no-communication
counter resetting process of FIG. 29 ends. When the
5 result at the step S201 is negative, the CPU 1001 ends the
no-communication counter resetting process of FIG. 28, and
does not perform the above step S202.

1.8.2 CCU SELECTING METHOD

In the signal line separation message
10 process of FIG. 28, the period of time during which the
copier 100 has no signal from the CCU 200 or the CSS 300
is detected by using the no-communication (N/C) counter.
Alternatively, the signal line separation message process
may be performed by using a different method.

15 FIG. 30 shows a communication sequence of
the CCU 200 and the copier 100 when a signal line
separation message process is performed by using a
selecting of the CCU 200 to the copiers 100.

In the present embodiment, the selecting of
20 the CCU 200 to the copier 100 (or one of the copiers 100)
is periodically performed. The period of performing the
selecting process is, for example, once for 24 hours or
less. In the present embodiment, the signal line
separation process is performed by using the selecting of
25 the CCU 200 to the copier 100.

1 As shown in FIG. 30, the selecting (ENQ) is
periodically transmitted from the CCU 200 to the copier
100 once for 24 hours or less. If there is a data link
between the CCU 200 and the copier 100 is established at
5 that time, the copier 100 transmits an acknowledgement
(ACK) to the CCU 200 in response to the selecting (ENQ).
After the ACK signal is received by the CCU 200, the CCU
200 transmits a message to the copier 100. After the
message is received by the copier 100, the copier 100
10 transmits an acknowledgment (ACK) to the CCU 200.
Further, after the ACK signal is received by the CCU 200,
the CCU 200 transmits an EOT signal to the copier 100.
When the EOT signal is received by the copier 100, the
selecting process is normally terminated.

15 Accordingly, in the present embodiment,
when all the conditions for the above-mentioned selecting
process are met, it is determined that the copier 100
normally communicates with the CCU 200. In this case, the
CPU 1001 performs only the steps S106-S108 of the signal
20 line separation message process of FIG. 28. When any of
the conditions for the above-mentioned selecting process
is not met, it is determined that the copier 100 has no
signal from the CCU 200. In this case, the CPU 1001
performs only the steps S104 and S105 of the signal line
25 separation message process of FIG. 28.

1 1.8.3 CSS SELECTING METHOD

FIG. 31 shows a communication sequence of the CSS 300 and the copier 100 when a signal line separation message process is performed by using a selecting of the CSS 300 to the copier 100.

In the present embodiment, the selecting of the CSS 300 to the copier 100 is performed when an access request is transmitted to the copier 100. In the present embodiment, the signal line separation process is performed by using the selecting of the CSS 300 to the copier 100.

As shown in FIG. 31, the selecting of the CSS 300 is transmitted through the CCU 200 to the copier 100 before transmitting an access request to the copier 100. If there is a data link between the CCU 200 and the copier 100 is established at that time, the copier 100 transmits an acknowledgement (ACK) to the CCU 200 in response to the selecting. After the ACK signal is received by the CCU 200, the CCU 200 transmits the access request (or the message) to the copier 100. After the message is received by the copier 100, the copier 100 transmits an acknowledgment (ACK) to the CCU 200. Then, the selecting of the CSS 300 to the copier 100 is normally terminated.

Accordingly, in the present embodiment,

1 when all the conditions for the above-mentioned selecting
process are met, it is determined that the copier 100
normally communicates with the CCU 200. In this case, the
CPU 1001 performs only the steps S106-S108 of the signal
5 line separation message process of FIG. 28. When any of
the conditions for the above-mentioned selecting process
is not met, it is determined that the copier 100 has no
signal from the CCU 200. In this case, the CPU 1001
performs only the steps S104 and S105 of the signal line
10 separation message process of FIG. 28.

1.8.4 CCU POLLING METHOD

FIG. 32 shows a communication sequence of
the CCU 200 and the copier 100 when a signal line
separation message process is performed by using a polling
15 of the CCU 200 to the copiers 100.

In the present embodiment, the polling of
the CCU 200 to the copiers 100 is periodically performed.
The period of performing the polling process is, for
example, once for one minute. In the present embodiment,
20 the signal line separation process is performed by using
the polling of the CCU 200 to the copiers 100.

As shown in FIG. 32, the polling (ENQ) is
transmitted from the CCU 200 to one of the copiers 100.
If there is a data link between the CCU 200 and the copier
25 100 is established at that time, the ENQ signal from the

1 CCU 200 is received by the copier 100. In response to the
polling (ENQ), the copier 100 transmits an acknowledgement
(ACK) or an end-of-transmission (EOT) to the CCU 200.
When the ACK or EOT signal is received by the CCU 200, the
5 polling process is normally terminated.

Accordingly, in the present embodiment,
when the condition for the above-mentioned polling process
is met, it is determined that the copier 100 normally
communicates with the CCU 200. In this case, the CPU 1001
10 performs only the steps S106-S108 of the signal line
separation message process of FIG. 28. When the condition
for the above-mentioned polling process is not met, it is
determined that the copier 100 has no signal from the CCU
200. In this case, the CPU 1001 performs only the steps
15 S104 and S105 of the signal line separation message
process of FIG. 28.

1.8.5 DETECTION OF VOLTAGE OF TERMINAL OF COMMUNICATION INTERFACE UNIT

FIG. 33 is a diagram for explaining a
20 signal line separation message process which is performed
by using a detection of a voltage of a receiving terminal
100R of the communication interface unit 1004 of the
copier 100.

In the image forming device management
25 system of the present embodiment, the data communication

1 between the CCU 200 and the copier 100 is carried out
through a communication line, and the communication line
is connected to the communication interface unit 1004 of
the copier 100 as shown in FIG. 2. A transmitting signal
5 on the communication line is input to or output from the
communication interface unit 1004 of the copier 100.
Hence, by detecting a voltage of a receiving terminal of
the communication interface unit 1004, it is possible to
determine whether the copier 100 has a signal from the CCU
10 200. For example, when the voltage of the receiving
terminal does not change over 10 minutes, it is determined
that a separation of the signal line between the CCU 200
and the copier 100 occurs.

As shown in FIG. 33, a receiving signal
15 line 1004R and a transmitting signal line 1004T are
connected at one end to the receiving terminal and a
transmitting terminal of the communication interface unit
1004 of the copier 100. The signal lines 1004R and 1004T
are connected at the other ends to the CCU 200.

20 FIG. 34 shows a signal line separation
message process performed by the CPU 1001 of the copier
100 by using a detected voltage of the receiving terminal
of the communication interface unit 1004 of the copier
100. In the present embodiment, the signal line
25 separation message process of FIG. 34 is periodically

1 initiated by the CPU 1001 every one second.

As shown in FIG. 34, at the start of the
signal line separation message process, the CPU 1001 at
step S121 waits for one second. After the step S121 is
5 performed, the CPU 1001 at step S122 determines whether a
detected voltage of the receiving terminal (1004R) of the
communication interface unit 1004 is in a high state.

When the result at the step S122 is
negative (or the detected voltage is in a low state), the
10 CPU 1001 at step S123 determines whether a previous
detected voltage of the receiving terminal 1004R is in a
high state. When the result at the step S123 is negative
(or the detected voltage is in a low state), the CPU 1001
at step S124 increments a counter.

15 On the other hand, when the result at the
step S123 is affirmative (or the detected voltage is in
the high state), the detected voltage of the receiving
terminal 1004R changes from the low state to the high
state. In this case, the CPU 1001 at step S125 resets the
20 counter to "0". After the step S125 is performed, the CPU
1001 performs the step S124 in which the counter is
incremented.

When the result at the step S122 is
affirmative (or the detected voltage is in the high
25 state), the CPU 1001 at step S126 determines whether the

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1 previous detected voltage of the receiving terminal 1004R
is in the low state. When the result at the step S126 is
negative, the detected voltage of the receiving terminal
1004R does not change. In this case, the CPU 1001
5 performs the above step S124 in which the counter is
incremented. On the other hand, when the result at the
step S126 is affirmative, the detected voltage of the
receiving terminal 1004 changes from the low state to the
high state. In this case, the CPU 1001 performs the above
10 steps S125 and S124.

After the step S124 is performed, the CPU
1001 at step S127 determines whether the counter is above
a given value. When the result at the step S127 is
affirmative, the CPU 1001 at step S128 displays a signal
15 line separation message on the operation part 1010 similar
to the step S104 of FIG. 28. When the result at the step
S127 is negative, the CPU 1001 at step S129 eliminates the
signal line separation message from the operation part
1010 similar to the step S107 of FIG. 28. In the present
20 embodiment, the given value with which the counter is
compared is preset to be equivalent to 10 minutes or
longer.

1.8.6 CONNECTION DETECTING LINE BETWEEN CCU AND COPIER

FIG. 35A and FIG. 35B show a signal line
25 separation message process which is performed by using a

1 connection detecting line provided between the CCU 200 and
the copier 100.

As shown in FIG. 35A, the receiving signal
line 1004R and the transmitting signal line 1004T are
5 connected at one end to the receiving terminal and the
transmitting terminal of the communication interface unit
1004 of the copier 100. The signal lines 1004R and 1004T
are connected at the other ends to the CCU 200. Further,
a connection detecting line is provided between the CCU
10 200 and the communication interface unit 1004. As shown
in FIG. 35B, the connection detecting line is grounded on
the side of the CCU 200, and the connection detecting line
is connected at the other end to a terminal of the
communication interface unit 1004. A reference voltage (5
15 V) is supplied through a resistor (R) to the connection
detecting line for detecting a voltage of the terminal of
the communication interface unit 1004. The CPU 1001
detects a voltage of the connection detecting line.

FIG. 36 shows a signal line separation
20 message process performed by the CPU 1001 of the copier
100 using the connect detection line between the CCU 200
and the copier 100. In the present embodiment, the signal
line separation message process of FIG. 36 is periodically
initiated by the CPU 1001 every one second.

25 As shown in FIG. 36, at the start of the

1 signal line separation message process, the CPU 1001 at
step S131 waits for one second. After the step S131 is
performed, the CPU 1001 at step S132 determines whether a
detected voltage of the connection detecting line is in a
5 high state.

When the result at the step S132 is
negative (or the detected voltage is in a low state), it
is determined that there is no separation of the signal
line between the CCU 200 and the copier 100. In this
10 case, the CPU 1001 at step S133 resets the counter to "0".
After the step S133 is performed, the CPU 1001 at step
S134 eliminates the signal line separation message from
the operation part 1010 similar to the step S107 of FIG.
28.

15 On the other hand, when the result at the
step S132 is affirmative (or the detected voltage is in
the high state), the CPU 1001 at step S135 increments the
counter. After the step S135 is performed, the CPU 1001
at step S136 determines whether the counter is larger than
20 a given value.

When the result at the step S136 is
affirmative (or the counter > the given value), the CPU
1001 at step S137 displays the signal line separation
message on the operation part 1010 similar to the step
25 S104 of FIG. 28. When the result at the step S136 is

1 negative (or the counter < the given value), the CPU 1001
performs the above step S134 in which the signal line
separation message is eliminated from the operation part
1010 similar to the step S107 of FIG. 28. In the present
5 embodiment, the given value with which the counter is
compared is preset to be equivalent to 10 minutes or
longer.

2. SECOND EMBODIMENT

10 The present embodiment of the image forming
device management system is characterized in that the
image forming device 100 of concern effectively inhibits
an automatic message transmission through the CCU 200 to
the CSS 300 when a jam of the image forming device 100
continuously occurs.

15 In the present embodiment, the structure of
the image forming device management system, the structure
of the image forming device 100, the structure of the CCU
200, the structure of the CSS 300, the communication
sequences, the data format of the messages, and the remote
20 message transmission process are essentially the same as
corresponding elements of the previous embodiment
described in the above sections 1.1 through 1.7.

A description will now be given of only
features of the second embodiment of the image forming
25 device management system which are different from those of

1 the previous embodiment.

2.1 JAM DETECTION PROCESS

2.1.1 FIRST JAM DETECTION PROCESS

FIG. 37 shows a first jam detection process
5 performed by the CPU 1001 the copier 100 in the present
embodiment of the image forming device management system.
The first jam detection process of FIG. 37 is initiated by
the CPU 1001 every time an internal mechanical condition
of the copier 100 changes.

10 As shown in FIG. 37, at the start of the
first jam detection process, the CPU 1001 at step S201
determines whether a jam of the copier 100 has occurred.
When the jam has occurred, the CPU 1001 at step S202
increments a continuous jam counter.

15 When no jam occurs, the CPU 1001 at step
S207 resets the continuous jam counter to "0". After the
step S207 is performed, the CPU 1001 ends the first jam
detection process of FIG. 37.

After the step S202 is performed, the CPU
20 1001 at step S203 determines whether the continuous jam
counter is equal to a given value. When the result at the
step S203 is affirmative, the CPU 1001 at step S204
performs an alarm message process in which an alarm
message is automatically transmitted through the CCU 200
25 to the CSS 300. After the step S204 is performed, the CPU

1 1001 ends the first jam detection process of FIG. 37.

On the other hand, when the result at the
step S203 is negative, the CPU 1001 at step S205
determines whether the continuous jam counter is above the
5 given value. When the result at the step S205 is
affirmative (or the continuous jam counter > the given
value), the CPU 1001 at step S206 sets the continuous jam
counter so as to be equal to the given value. After the
step S206 is performed, the CPU 1001 ends the first jam
10 detection process of FIG. 37. In this case, the CPU 1001
does not perform the alarm message process of the step
S204. Therefore, it is possible to effectively inhibit
the automatic message transmission of the copier 100 to
the CSS 300 when a jam of the copier 100 continuously
15 occurs.

When the result at the step S205 is
negative (or the continuous jam counter < the given
value), the CPU 1001 ends the first jam detection process
of FIG. 37.

20 2.1.2 SECOND JAM DETECTION PROCESS

FIG. 38 shows a second jam detection
process performed by the CPU 1001 of the copier 100 in the
present embodiment. The second jam detection process of
FIG. 38 is initiated by the CPU 1001 every time an
25 internal mechanical condition of the copier 100 changes.

1 FIG. 39 shows the second jam detection
process performed by the CPU 1001 of the copier 100 in the
present embodiment. The second jam detection process of
FIG. 39 is periodically initiated by the CPU 1001 by using
5 a timer.

In the second jam detection process of FIG.
38, the CPU 1001 at step S211 determines whether the
copier 100 is in a jam state. When the copier 100 is in
the jam state, the CPU 1001 at step S212 determines
10 whether a long-period jam counter flag is equal to "0".

When the copier 100 is not in a jam state,
the CPU 1001 at step S214 resets the long-period jam
counter flag to "0". After the step S214 is performed,
the CPU 1001 ends the second jam detection process of FIG.
15 38.

When the result at the step S212 is
negative (or the long-period jam counter flag is not equal
to "0"), the CPU 1001 ends the second jam detection
process of FIG. 38. On the other hand, when the result at
20 the step S212 is affirmative (or the long-period jam
counter flag is equal to "0"), the CPU 1001 at step S213
sets the long-period jam counter flag to "1". After the
step S213 is performed, the CPU 1001 ends the second jam
detection process of FIG. 38.

25 In the second jam detection process of FIG.

1 39, the CPU 1001 at step S221 determines whether the long-
period jam counter flag is equal to "1". When the result
at the step S221 is affirmative, it is determined that the
long-period jam counter should be set in an ON state to
5 start counting for the detection of a period for which the
copier 100 continues to be in the jam state. The CPU 1001
at step S222 increments the long-period jam counter.

On the other hand, when the result at the
step S221 is negative, it is determined that the long-
10 period jam counter should be set in an OFF state to stop
counting. The CPU 1001 at step S226 resets the long-
period jam counter to "0". After the step S226 is
performed, the CPU 1001 ends the second jam detection
process of FIG. 39.

15 After the step S222 is performed, the CPU
1001 at step S223 determines whether the long-period jam
counter is above a given value. When the result at the
step S223 is negative, the CPU 1001 ends the second jam
detection process of FIG. 39. On the other hand, when the
20 result at the step S223 is affirmative, the CPU 1001 at
step S224 performs a long-period jam alarm message process
in which a long-period jam alarm message is automatically
transmitted through the CCU 200 to the CSS 300. After the
step S224 is performed, the CPU 1001 at step S225 sets the
25 long-period jam counter flag to "2" and resets the long-

1 period jam counter to "0". After the step S225 is
performed, the CPU 1001 ends the first jam detection
process of FIG. 39. Therefore, it is possible to
effectively inhibit the automatic message transmission of
5 the copier 100 to the CSS 300 when the copier 100
continues to be in the jam state for a long period.

2.2 CSS FUNCTION SETTING PROCESS

FIG. 40 shows a CSS function setting
process performed by the CPU 1001 of the copier 100 in the
10 present embodiment. The CSS function setting process of
FIG. 40 is periodically initiated by the CPU 1001 by using
a timer.

As shown in FIG. 40, at the start of the
CSS function setting process, the CPU 1001 at step S231
15 determines whether a CSS function flag is equal to "1".
When the result at the step S231 is affirmative, the CPU
at step S232 determines whether a previous CSS function
flag is equal to "0". When the previous CSS function flag
is equal to "0", the CPU 1001 at step S233 resets the
20 continuous jam counter to "0", resets the long-period jam
counter to "0", and resets the long-period jam counter
flag to "0". After the step S233 is performed, the CPU
1001 performs step S234.

On the other hand, when the previous CSS
25 function flag is equal to "1", the CPU 1001 at step S234

1 retains the previous CSS function flag in the memory of
the copier 100. After the step S234 is performed, the CPU
1001 terminates the CSS function setting process.

When the result at the step S231 is
5 negative (or the CSS function flag is equal to "0"), the
CPU 1001 at step S235 performs a remote message (R/M)
inhibition process. After the R/M inhibition process is
performed, the CPU 1001 of the copier 100 is inhibited
from performing the R/M transmission to the CSS 300 or the
10 statistical process. After the step S235 is performed,
the CPU 1001 performs the step S234.

3. THIRD EMBODIMENT

The present embodiment of the image forming
device management system is characterized in that the
15 image forming device of concern starts an automatic
message transmission only in an appropriate situation when
a maintenance service of the image forming device is
performed by a serviceman.

In the present embodiment, the structure of
20 the image forming device management system, the structure
of the image forming device 100, the structure of the CCU
200, the structure of the CSS 300, the communication
sequences, the data format of the messages, and the remote
message transmission process are essentially the same as
25 corresponding elements of the previous embodiment

1 described in the above sections 1.1 through 1.7.

A description will now be given of only features of the third embodiment of the image forming device management system which are different from those of the previous embodiment.

3.1 SERVICEMAN MAINTENANCE SERVICE START/END MESSAGE PROCESS (FIRST EXAMPLE)

FIG. 41 shows a maintenance service start/end message process which is performed by the copier 100 in a third embodiment of the image forming device management system. The maintenance service start/end message process of FIG. 41 is initiated when an event (which is either a serviceman visit message request or a serviceman visit end message request) occurs.

As shown in FIG. 41, at the start of the maintenance service start/end message process, the CPU 1001 at step S301 determines whether a serviceman visit message is requested by the serviceman. When the result at the step S301 is affirmative, the CPU 1001 at step S302 sets a serviceman visit flag to "1" (or an ON state). After the step S302 is performed, the CPU 1001 terminates the maintenance service start/end message process.

When the result at the step S301 is negative (or the serviceman visit message is not requested), the CPU 1001 at step S303 determines whether a

1 serviceman visit end message is requested by the
serviceman. When the result at the step S303 is
affirmative, the CPU 1001 at step S304 resets the
serviceman visit flag to "0" (or an OFF state). After the
5 step S304 is performed, the CPU 1001 terminates the
maintenance service start/end message process of FIG. 41.
In the present embodiment, the serviceman visit flag is
retained in the RAM 1003 which is a non-volatile (N/V)
memory or a battery backup RAM. Hence, even when a power
10 switch of the copier 100 is turned OFF, it is possible to
prevent the content of the serviceman visit flag from
being lost.

FIG. 42 shows another maintenance service
start/end message process performed by the copier 100 in
15 the third embodiment. The maintenance service start/end
message process of FIG. 42 is initiated when an event
(which is a remote message (R/M) process execute request)
occurs.

As shown in FIG. 42, at the start of the
20 maintenance service start/end message process, the CPU
1001 at step S311 determines whether a received remote
message (R/M) process execute request is related to a R/M
process different than a replenishment part message
process. When the result at the step S311 is negative,
25 the CPU 1001 ends the maintenance service start/end

1 message process of FIG. 42. When the result at the step
S311 is affirmative, the CPU 1001 at step S312 determines
whether the serviceman visit flag is equal to "1".

5 When the result at the step S312 is
affirmative (or the serviceman visit flag = 1), the CPU
1001 at step S313 cancels the R/M process execute request.
After the step S313 is performed, the CPU 1001 terminates
the maintenance service start/end message process of FIG.
42.

10 When the result at the step S312 is
negative (or the serviceman visit flag = 0), the CPU 1001
at step S314 performs the remote message (R/M)
transmission process in response to the execute request.
After the step S314 is performed, the CPU 1001 terminates
15 the maintenance service start/end message process of FIG.
42.

3.2 SERVICEMAN MAINTENANCE SERVICE START/END MESSAGE PROCESS (SECOND EXAMPLE)

20 FIG. 43 shows a further maintenance service
start/end message process which is performed by the copier
100 in the third embodiment. The maintenance service
start/end message process of FIG. 43 is initiated when an
event (which is either a serviceman visit message request
or a serviceman visit end message request) occurs.

25 As shown in FIG. 43, at the start of the

1 maintenance service start/end message process, the CPU
1001 at step S321 determines whether the serviceman visit
message is requested by the serviceman. When the result
at the step S321 is affirmative, the CPU 1001 at step S322
5 sets the serviceman visit flag to "1". After the step
S322 is performed, the CPU 1001 terminates the maintenance
service start/end message process of FIG. 43.

When the result at the step S321 is
negative (or the serviceman visit message is not
10 requested), the CPU 1001 at step S323 determines whether
the serviceman visit end message is requested by the
serviceman. When the result at the step S323 is
affirmative, the CPU 1001 at step S324 resets the
serviceman visit flag to "0". After the step S324 is
15 performed, the CPU 1001 at step S325 resets the continuous
jam counter to "0", resets the long-period jam counter to
"0", and resets a door-open time counter to "0". After
the step S325 is performed, the CPU 1001 terminates the
maintenance service start/end message process of FIG. 43.

20 In the present embodiment, the continuous
jam counter is used to automatically transmit a continuous
jam message to the CSS 300 when a number of jams has
continuously occurred on the copier 100. The long-period
jam counter is used to automatically transmit a long-
25 period jam message to the CSS 300 when the copier 100 is

1 continuously in a jam state for a long period. The door-
open time counter is used to automatically transmit a
long-period door-open message to the CSS 300 when a door
of the copier 100 is continuously open for a long period.

5 4. FOURTH EMBODIMENT

4.1 STRUCTURE OF SYSTEM

FIG. 44 shows a fourth embodiment of the
image forming device management system of the present
invention. As shown in FIG. 44, in the image forming
10 device management system of the present embodiment, a
plurality of image forming devices 400 (such as copiers
401 through 405) are provided. Although the image forming
devices 400 may be copiers, facsimiles or printers, in the
following description, for the sake of convenience, one of
15 the image forming devices 400 will be called the image
forming device 400 or the copier 400 unless otherwise
specified.

In the image forming device management
system of FIG. 44, a data communication device DCD 420 is
20 also provided, and each of the image forming devices 400
is connected to the DCD 420. The DCD 420 is linked to a
central service station CSS 460 at a remote location via a
public switched network PSN 450. The maintenance of the
image forming devices 400 are remotely controlled by the
25 CSS 460 through the DCD 420 and the PSN 450 in a

1 centralized manner. The CSS 460 in the present embodiment
is essentially the same as the CSS 300 in the previous
embodiments.

5 The DCD 420 in the present embodiment
functions to selectively transmit a control signal from
the CSS 460 to one of the image forming devices 400, and
to transmit a message from one of the image forming
devices 400 to the CSS 460 through the PSN 450. A power
switch of the DCD 420 is continuously turned ON for 24
10 hours, and the DCD 420 is capable of always communicating
with the CSS 460 even when the image forming devices 400
are in OFF state.

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15 The interface between each copier 400 and
the DCD 420 is provided by a multidrop connection which is
in conformity with RS-485 standard. The communication
sequence between each copier 400 and the DCD 420 is
performed in accordance with basic data transmission
procedures. The DCD 420 can communicate with one of the
copiers 400 after a data link between the DCD 420 and the
20 copier 400 is established by using a centralized
polling/selecting control method. A specific device
address can be set for each of the copiers 400 by setting
an address setting switch of each copier 400, and a
polling address and a selecting address can be set for
25 each copier 400 in accordance with the specific device

1 address.

4.2 DATA COMMUNICATION DEVICE (DCD)

FIG. 45 shows a data communication device
DCD in the fourth embodiment of the image forming device
5 management system.

As shown in FIG. 45, the DCD 420 generally
has a control part 421, an auto dialer 422, and a
switching control part 423. A telephone 424 is connected
to the switching control part 423. The control part 421
10 controls the plurality of the image forming devices 400
and controls receiving of a signal sent through the PSN
450 to the DCD 420 by the CSS 460. The auto dialer 422
functions to automatically send a call to the CSS 460 in
accordance with a message sent by one of the image forming
15 device 400. The switching control part 423 carries out a
connection control to the PSN 450 and a switching of the
DCD 420 to one of the telephone 424 and the image forming
device 400.

In the DCD 420 of FIG. 45, the control part
20 421 (the structure of which is not shown in FIG. 45)
includes a CPU which executes a control program, a ROM
which stores the control program and control data therein,
a RAM which provides a working storage area for the CPU
when executing the control program, a non-volatile (N/V)
25 RAM which retains operating parameters by using a battery,

1 a plurality of serial communication control units (CCU),
an input/output (I/O) port, and a real-time (R/T) clock
which provides a current time. The control part 421 has
the structure that is essentially the same as the
5 structure of a control part of the image forming device
400 shown in FIG. 48. In the non-volatile RAM of the
control part 421, transmission data exchanged between the
image forming devices 400 and the CSS 460, device codes
and ID codes of the image forming devices 400, a telephone
10 number of the CSS 460, the number of redials, a redial
period and so on are stored.

4.3 FUNCTIONS OF SYSTEM

The image forming device management system
of FIG. 44 provides the following functions:

- 15 (1) control of communications from the CSS
460 to the image forming devices 400;
- (2) control of communications from each
image forming device 400 to the CSS 460 or communications
from each image forming device 400 to the DCD 420; and
- 20 (3) control by the DCD 420.

A description will now be given of these functions of the
image forming device management system in the present
embodiment.

4.3.1 CONTROL OF COMMUNICATIONS FROM CSS TO COPIERS

25 The image forming device management system

1 of FIG. 44 can read out or reset a total copy count, a
copy count of each paper tray, a copy count of each sheet
size, a total misfeed count, a misfeed count of each sheet
size and a misfeed count of each sheet transport position
5 in a particular one of the image forming devices 400.

The image forming device management system
of FIG. 44 can set or read out adjustment values of a
controlled voltage, current, resistance and timing of each
of various elements of each image forming device 400.

10 The image forming device management system
of FIG. 44 can control transmission and receiving of a
response to one of the above-mentioned controls which is
delivered to the CSS 460 by one of the image forming
devices 400.

15 The DCD 420 receives a command from the CSS
460 and performs a selecting to a particular one of the
image forming devices 400 in accordance with the command.
When the selecting to the particular one of the image
forming devices 400 is performed by the DCD 420, one of
20 the above controls is carried out in the image forming
device management system of the present embodiment.

FIG. 46 shows a selecting process performed
to a particular one of the image forming devices 400 by
the DCD 420 in the fourth embodiment. Suppose that a
25 particular one of the image forming devices 400 has a

1 device code, and a specific control code is assigned to
indicate a predetermined selecting function.

At the start of the selecting process, the
DCD 420 sends the specific control code and the device
5 code through the serial CCU to the particular one of the
image forming devices 400 (which will be called the copier
400). The copier 400 receives the specific control code
and the device code. After the specific control code is
detected, the copier 400 determines whether the received
10 device code matches a device code of the copier 400. When
the received device code matches the device code of the
copier 400, the copier 400 recognizes that the selecting
of the DCD 420 is performed to the copier 400. Instead of
the specific control code, a combination of certain codes
15 may be used to indicate the selecting function.

When the copier 400 has a transmission data
upon the selecting of the DCD 420 to the copier 400, the
copier 400 outputs a busy signal. As shown in FIG. 46,
the DCD 420 at step S401 detects whether a busy signal
20 from the copier 400 is received. When the busy signal is
received, the control of the DCD 420 is transferred to a
polling process. When the copier 400 has no transmission
data upon the selecting, the copier 400 does not output a
busy signal. When the copier 400 determines that it can
25 respond to the selecting, the copier 400 outputs an

1 acknowledgment (ACK). The DCD 420 at step S402 detects
whether an ACK from the copier 400 is received. When the
ACK is received by the DCD 420, the DCD 420 at step S405
transmits a message to the copier 400. After the message
5 is transmitted to the copier 400, the copier 400 outputs
an end-of-transmission (EOT) signal. The DCD 420 at step
S406 detects whether the EOT signal from the copier 400 is
received. After the EOT signal is received by the DCD
420, the selecting process is terminated and the control
10 of the DCD 420 is transferred to the polling process.

When the copier 400 determines that it
cannot respond to the selecting, the copier 400 outputs a
negative acknowledgment (ACK). The DCD 420 at step S403
detects whether a negative ACK from the copier 400 is
15 received. When a negative ACK is not received, the DCD
420 at step S404 detects whether a time-out period has
elapsed since the start of the selecting. When the time-
out period has elapsed, the selecting process is
terminated, and the control of the DCD 420 is transferred
20 to the polling process.

4.3.2 CONTROL OF COMMUNICATIONS FROM COPIER TO CSS OR COMMUNICATIONS FROM COPIER TO DCD

When a significant failure of the copier
400 takes place, the copier 400 immediately transmits a
25 remote message (or an emergency message) to the DCD 420 or

1 to the CSS 460 through the PSN 450. The remote message
notifies that the failure of the copier 400 has occurred.

The copier 400 has a service program mode
in addition to an image formation mode. When the image
5 formation mode of the copier 400 is shifted to the service
program mode by pressing a given mode shift key, the
copier 400 immediately transmits a remote message (or an
emergency message) to the DCD 420 or to the CSS 460
through the PSN 450. The remote message notifies that the
10 service program mode of the copier 400 has started.

When the current copy count of the copier
400 reaches a predetermined number of copy sheets, the
copier 400 immediately transmits a remote message (or an
emergency message) to the DCD 420 or to the CSS 460
15 through the PSN 450. The remote message notifies that a
copy sheet replenishment is requested by the copier 400.

The DCD 420 periodically performs a polling
to the image forming devices 400 at regular intervals so
as to detect whether a request from any of the image
20 forming devices 400 is sent to the DCD 420. When the
polling to the image forming device 400 is performed by
the DCD 420, one of the above-mentioned controls is
carried out in the image forming device management system
of the present embodiment.

25 FIG. 47 shows a polling process performed

1 to the image forming devices 400 by the DCD 420. Suppose
that the image forming devices 400 have respective device
codes and a specific control code indicating a
predetermined polling function is assigned.

5 At the start of the polling process, the
DCD 420 sends the specific control code and the device
code through the serial CCU to one of the image forming
devices 400 (which will be called the copier 401). The
copier 401 receives the specific control code and the
10 device code. After the specific control code is detected,
the copier 401 determines whether the received device code
matches a device code of the copier 401. When the
received device code matches the device code of the copier
401, the copier 401 recognizes that the polling of the DCD
15 420 is performed to the copier 401. Instead of the
specific control code, a combination of certain codes may
be used to indicate the predetermined polling function.

As shown in FIG. 47, the DCD 420 at step
S411 detects whether an EOT signal from the copier 401 is
20 received. When the EOT signal is received, the DCD 420
terminates the polling to the copier 401, and the control
of the DCD 420 is transferred to a polling to the copier
402. When an EOT signal from the copier 401 is not
received, the DCD 420 at step S412 detects whether a
25 transmission request sent by the copier 401 is received.

1 When the request is not received by the DCD 420, the DCD
420 at step S413 detects whether a time-out period has
elapsed since the start of the polling to the copier 401.
When the time-out period has elapsed, the polling to the
5 copier 401 is terminated, and the control of the DCD 420
is transferred to the polling to the copier 402.

4.3.3 CONTROL BY DCD

The DCD 420 in the present embodiment can
read out a total copy count from one of the image forming
10 devices 400. The DCD 420 can transmit a response, sent by
one of the image forming devices 400, through the PSN 450
to the CSS 460.

When the selecting to a particular one of
the image forming devices 400 is performed by the DCD 420
15 at regular intervals, the reading of a total copy count
from the particular one of the image forming devices 400
is carried out by the DCD 420. The DCD 420 includes a
plurality of memories for storing respective total copy
counts read from the image forming devices 400. The DCD
20 420 transmits the total copy count, retained in one of the
memories, through the PSN 450 to the CSS 460 at regular
intervals.

4.4 CONTROL PART OF IMAGE FORMING DEVICE

FIG. 48 shows a control part of each image
25 forming device 400 in the present embodiment.

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1 As shown in FIG. 48, the control part of
the image forming device 400 includes a controller 511
which generally has a CPU 500, a bus 501, a real-time
(R/T) clock 510, a ROM 502, a RAM 503, a non-volatile
5 (N/V) RAM 504, an input/output (I/O) port 505, a first
serial CCU 506, a second serial CCU 507, and a third
serial CCU 508. Further, the control part of the image
forming device 400 includes a PI (personal interface) 509.
The elements of the controller 511 and the PI 509 are
10 interconnected by the bus 501.

 The CPU 500 executes a control program.
The ROM 502 stores the control program and control data
therein. The RAM 503 provides a working storage area for
the CPU 500 when executing the control program. The non-
15 volatile RAM 504 retains operating parameters by using a
battery. In the non-volatile RAM 504, transmission data
exchanged between the image forming devices 400 and the
CSS 460, device codes and ID codes of the image forming
devices 400, a telephone number of the CSS 460, the number
20 of redials, and a redial period are stored. The real-time
(R/T) clock 510 provides a current time.

 The I/O port 505 has an output connected to
various motors, solenoids and clutches of the image
forming device 400, and has an input connected to various
25 sensors and switches of the image forming device 400. The

1 first serial CCU 506 provides an interface between the CPU
500 and an operation part (not shown) of the image forming
device 400. The second serial CCU 507 provides an
interface between the CPU 500 and a document feeder (not
5 shown) of the image forming device 400. The third serial
CCU 508 provides an interface between the CPU 500 and a
copy postprocess part (not shown) of the image forming
device 400.

The PI 509 provides an interface between
10 the CPU 500 and the DCD 420. If the processing ability of
the CPU 500 is adequately high, the functions of the PI
509 may be incorporated in the CPU 500.

The main functions of the PI 509 are (1)
the monitoring of a polling or selecting of the DCD 420,
15 (2) the processing of an acknowledgment or a negative
acknowledgment to the DCD 420, (3) the check of
correctness of a message transmitted to or received from
the DCD 420, the parity check and the error detection, and
(4) the processing of a header of a message transmitted to
20 or received from the DCD 420.

4.4.1 STRUCTURE OF PERSONAL INTERFACE

FIG. 49 shows the PI (personal interface)
509 in the control part of the image forming device 400 in
the present embodiment.

25 As shown in FIG. 49, the PI 509 includes a

1 CPU 600, a local bus 602, a dual-port memory 602, a plurality of registers 603 through 606, an input port 607, a device code setting switch 608, and a serial communication interface unit 609.

5 The CPU 600 is a one-chip microcomputer including a central processing unit, a ROM and a RAM. The CPU 600 controls the elements of the PI 509. The dual-port memory 602 can be accessed by both the CPU 600 of the PI 509 and the CPU 500 of the image forming device 500.

10 The dual-port memory 602 is used when exchanging a message between the PI 509 and the controller 511. The registers 603 through 607 are used for controlling the elements of the PI 509 when exchanging a message between the PI 509 and the controller 511.

15 The device code setting switch 608 is provided in the PI 509 of each image forming device 400 to set a specific device address of the image forming device 400. The specific device code of each image forming device 400 is used to identify the image forming device 20 400 when a polling or selecting of the DCD 420 is performed. The serial communication interface unit 609 is connected to the DCD 420 or the PI 509 of a different image forming device 400.

4.5 CONTROL PANEL

25 FIG. 50 shows a control panel 701 of the

1 image forming device 400 in the present embodiment. The
control panel 701 includes a control part which is
essentially the same as the control part of the image
forming device 400 shown in FIG. 48.

5 As shown in FIG. 50, the control panel 701
includes ten keys 710, a clear/stop key 711, a print key
709, an enter key 712, an interrupt key 713, a preheat/
mode clear key 714, a mode check key 704, a screen change
key 705, a call key 706, a registration key 707, a
10 guidance key 708, a display contrast volume 703, and a
character display part 702.

4.5.1 CHARACTER DISPLAY PART

FIG. 51 shows the character display part
702 in the control panel 701 of the image forming device
15 400 of FIG. 50.

The character display part 702 of FIG. 51
is prepared by using full-dot liquid crystal display
elements with a matrix touch-panel switch of a transparent
sheet material attached thereto. In the matrix touch-
20 panel switch, a number of touch sensors (provided for each
of 8 x 8 picture elements) are internally provided. A key
of the character display part 702 is turned ON or OFF by
pressing or touching it. In addition, indication of an
operating state of the image forming device 400, such as
25 "copy possible", "during coping" or "no paper", is

1 displayed on the character display part 702 of the image
forming device 400.

4.6 DATA FORMAT OF MESSAGES

FIG. 52 shows a data format of a message
5 transmitted between the CSS 460 and the DCD 420 in the
fourth embodiment.

As shown in FIG. 52, the message includes
an SYN 910, an SOH 920, an SN 930, an STX 940, a text 950,
an ETB or ETX 960, and an LRC 970. The text 950 is
10 exchanged between the CSS 460 and the DCD 420 together
with the SYN 910, the SOH 920, the SN 930, the STX 940,
the ETB or ETX 960, and the LRC 970. The SN (serial
number) 930 indicates a transmission block number of the
message within blocks of one transmission. One of numeral
15 values "00" through "99" is sequentially assigned to the
SN 930 of each block.

The text 950 includes an ID code 951, a
type code 952, and a number of records 953 (including
records 953(1) through 953(N)). Each of the records 953
20 includes a parameter code 955, the number of digits 956,
and a data 957. The ID code 951 is used to identify a
particular one of the image forming device 400 and the DCD
420. The type code 952 includes a process code, and a
text originating device ID and a text receiving device ID
25 added thereto. The type code 952 is predetermined as in

1 the following table.

TABLE 1:

5	CODE	PROCESS NAME	DESCRIPTION
	30	EMERGENCY AUTO CALL	R/M TRANSMISSION IN CASE OF EMERGENCY
10	31	MANUAL CALL	R/M TRANSMISSION WHEN MANUAL SWITCH IS TURNED ON
	32	ALARM MESSAGE	R/M TRANSMISSION WHEN ALARM MESSAGE OCCURS
	22	BLOCK BILLING PROCESS	R/M TRANSMISSION WHEN A CONTRACT COPY COUNT IS 15 REACHED
	02	READ PROCESS	READING OF DATA FROM COPIER
	04	WRITE PROCESS	WRITING OF DATA TO COPIER
	03	EXECUTE PROCESS	EXECUTION OF TEST BY R/M
20	08	DEVICE CODE CHECK	PROCESS TO CHECK COMMUNICA- TION FUNCTION

Each record 953, including the parameter code 955, the number of digits 956 and the data 957, is predetermined as in the following table.

25 TABLE 2:

1	-----	-----
	CODE	DESCRIPTION
	-----	-----
	PARAMETER CODE	INDICATES A KIND OF OPERAT-
5		ING PARAMETER OF A COPIER
	NO. OF DIGITS	INDICATES A LENGTH OF DATA
		WHICH FOLLOWS
	DATA	THE CONTENTS OF EACH RECORD
	-----	-----

10 As shown in FIG. 52, a separator 954 (which is a semicolon) is inserted between the ID code 951 and the type code 952, between the type code 952 and the first record 953(1), and between the respective records 953.

15 FIG. 53 shows a data format of a message transmitted between the DCD 420 and the PI 509.

20 As shown in FIG. 53, the message includes the SYN 910, the SOH 920, the SN 930, the STX 940, a text 950, the ETB or ETX 960, and the LRC 970. The text 950 includes a device code 958, a process code 959, and a number of records 953 (including records 953(1) through 953(N)). The device code 958 is a specific device address of each of the copiers 400 set by the device code setting switch 608 of the PI 509 of each image forming device 400. The correlation between the device code 958 and the ID
25 code 951 is retained in the non-volatile RAM of the DCD

1 420. When each image forming device 400 is installed on a user site, the device code 958 is read from the image forming device 400 and transmitted to the DCD 420.

5 The process code 959 is the same as the process code included in the type code 952. The process code 959 is produced by eliminating the text originating device ID and the text receiving device ID from the type code 952. Each of the records 953 in the message of FIG. 53 includes the parameter code 955, the number of digits
10 956, and the data 957, similar to that in the message of FIG. 52.

FIG. 54 shows a data format of a message transmitted between the PI 509 and the image forming device 400 (or the controller 511). As shown in FIG. 54,
15 the message is produced by eliminating the header, the device code and the parity portion from the message of FIG. 53 transmitted between the DCD 420 and the PI 509.

4.7 BLOCK BILLING FUNCTION

The block billing function is provided for
20 the image forming device management system to establish a charge for a predetermined number of copy sheets as a contract for use of each image forming device 400. To attain the block billing function, it is necessary that a precise copy count at a start of the block billing of each
25 image forming device 400 and a precise copy count at an

1 end of the block billing be safely managed by the image
forming device management system.

4.7.1 BLOCK BILLING START PROCESS

5 In the present embodiment, each of the
image forming devices 400 receives a non-resettable copy
count and a remote message cycle, both transmitted to the
image forming device 400 by the CSS 460 through the DCD
420 at a start of the block billing contract. The non-
resettable copy count indicates a predetermined number of
10 copy sheets related to the block billing contract for use
of the image forming device 400. The remote message cycle
indicates a frequency at which the image forming device
400 transmits a remote message (including a block billing
start copy count) to the CSS 460. The transmission of the
15 non-resettable copy count and the remote message cycle to
the image forming device 400 is carried out by using the
selecting of the DCD 420 to the image forming device 400.

FIG. 55 shows a data format of a remote
message transmitted between the PI 509 and the image
20 forming device 400 when the image forming device 400
receives the remote message (including a block billing
start copy count) from the CSS 460.

As shown in FIG. 55, the data format of the
message is essentially the same as that of the message of
25 FIG. 54. The message of FIG. 55 includes a process code

1 1201, a number of records 1202 (including records 1202(1) through 1202(N)), and the ETB or ETX. Each record 1202 includes a parameter code 1203, the number of digits 1204, and a data 1205.

5 The process code 1201 is set at "04" as listed in the TABLE 1 above. The parameter code 1203 of the record 1202(1) indicates a kind of an operating parameter (or a block billing start copy count). The number of digits 1204 is set at "08" in ASCII code. The
10 data 1205 is set at the block billing start copy count, and this data is written to the memory of the image forming device 400 as the non-resettable copy count. The record 1202(1) carrying the non-resettable copy count is transmitted from the CSS 460 through the PI 509 to the
15 image forming device 400. Similarly, the record 1202(2) carrying the remote message cycle is transmitted from the CSS 460 through the PI 509 to the image forming device 400.

The non-resettable copy count and the
20 remote message cycle, both transmitted to the image forming device 400 by the CSS 460 through the DCD 420 at a start of the block billing contract, are processed by the CPU 500 of the image forming device 400 and stored in the non-volatile RAM 504. Hence, the CPU 500 acts as a
25 receiving means for receiving the non-resettable copy

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1 count and the remote message cycle, and the non-volatile
RAM 504 acts as a first storage means for storing the non-
resettable copy count and the remote message cycle.
Further, the CPU 500 acts as a control means for setting
5 the image forming device 400 in a remote message enable
state when a difference between a current copy count and
the received copy count reaches an integral multiple of
the remote message cycle. The CPU 500 acts as a remote
message means for transmitting a remote message through
10 the DCD 420 to the CSS 460 after the image forming device
400 is set in the remote message enable state. The non-
volatile RAM 504 acts as a second storage means for
storing a current copy count that is incremented every
time an image formation of one copy sheet is performed by
15 the image forming device 400.

FIG. 56 shows a block billing process
performed by the CPU 500 of the image forming device 400
in the present embodiment.

In the present embodiment, suppose that a
20 paper-out (P/O) sensor (not shown) for sensing an ejection
of a copy sheet out of the image forming device 400 is
connected to an input of the I/O port 505, and outputs a
P/O sensor signal to the CPU 500 via the I/O port 505.

As shown in FIG. 56, at the start of the
25 block billing process, the CPU 500 at step 1301 determines

1 whether the image forming device 400 is in an image
forming state. When the image forming device 400 is in an
image forming state, the CPU 500 at step 1302 determines
whether the P/O sensor signal is at its falling edge.
5 When the result at the step 1302 is affirmative, the CPU
500 at step 1303 increments the current copy count of the
image forming device 400. The CPU 500 at step 1304
determines whether a difference between the current copy
count and the received copy count (or the block billing
10 start copy count) reaches an integral multiple of the
remote message cycle.

In the step 1304, it is determined whether
the following calculation (or the division) results in an
integer:

15 (the current copy count - the received copy count)
/(the remote message cycle) (1)

When the result at the step 1304 is
affirmative, the CPU 500 at step 1305 sets a remote
message (R/M) flag to "1" (or an ON state). After the
20 step 1305 is performed, the CPU 500 ends the block billing
process of FIG. 56.

When the result at the step 1301 is
negative (or the image forming device 400 stops the image
formation), the CPU 500 at step 1306 determines whether
25 the R/M enable flag is equal to "1". When the result at

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1 the step 1306 is affirmative, the CPU 500 at step 1307
transmits a remote message through the DCD 420 to the CSS
460. The transmission of the message is carried out by
using a selecting of the DCD 420. After the step 1307 is
5 performed, the CPU 500 at step 1308 resets the R/M enable
flag to "0" (or an OFF state). After the step 1308 is
performed, the CPU 500 ends the block billing process.

In the block billing process of FIG. 56,
the image forming device 400 is unable to perform the
10 automatic message transmission during the image formation.
However, if the ability of the image forming device 400,
including the CPU 500, is adequately high, it is possible
to perform the automatic message transmission even when
the image forming device 400 is in the image forming
15 state. In such a case, the setting of the R/M enable flag
to "1" or "0" is not needed.

4.7.2 DATA FORMAT OF REMOTE MESSAGE

FIG. 57 shows a data format of a remote
message transmitted between the PI 509 and the image
20 forming device 400 when the step 1307 in the block billing
process of FIG. 56 is performed. The data format of the
remote message is essentially the same as that of the
message of FIG. 54.

As shown in FIG. 57, the remote message
25 includes a process code 1401, a number of records 1402

1 (including records 1402(1) through 1402(N)), and the ETB
or ETX. Each record 1402 includes a parameter code 1403,
the number of digits 1404, and a data 1405.

5 The process code 1401 is set at "22" as
listed in the TABLE 1 above. The parameter code 1403 of
the record 1402(1) indicates a kind of an operating
parameter (or a block billing start copy count). The
number of digits 1404 is set at "01" in ASCII code. The
data 1405 is set at the block billing start copy count is
10 set at "1", and this data indicates an occurrence of a
remote message. The data 1405 when the automatic message
transmission is performed is always set at "1", and "0" is
not used for the data 1405. The records 1402(2) through
1402(N) may be omitted if they are not needed.

15 A description of the data formats of a
remote message transmitted between the PI 509 and the DCD
420 and a remote message transmitted between the DCD 420
and the CSS 460 will be omitted. Similar to the data
format of the remote message of FIG. 57, the data formats
20 of these remote messages may be defined.

4.7.3 BLOCK BILLING END PROCESS

A block billing end process performed by
the CPU 500 of the image forming device 400 in the present
embodiment is essentially the same as the block billing
25 process of FIG. 56 except that the block billing start

1 copy count of the latter process is substituted by a block
billing end copy count.

At the start of the block billing end
process, the CPU 500 at step 1301 determines whether the
5 image forming device 400 is in an image forming state.
When the image forming device 400 is in an image forming
state, the CPU 500 at step 1302 determines whether the P/O
sensor signal is at its falling edge. When the result at
the step 1302 is affirmative, the CPU 500 at step 1303
10 increments the current copy count of the image forming
device 400. The CPU 500 at step 1304 determines whether a
difference between the current copy count and the received
copy count (or the block billing end copy count) reaches
an integral multiple of the remote message cycle.

15 In the step 1304, it is determined whether
the following calculation (or the division) results in an
integer:

$$\frac{(\text{the received copy count} - \text{the current copy count})}{(\text{the remote message cycle})} \quad (2)$$

20 When the result at the step 1304 is
affirmative, the CPU 500 at step 1305 sets the remote
message (R/M) flag to "1" (or the ON state). After the
step 1305 is performed, the CPU 500 terminates the block
billing end process.

25 When the result at the step 1301 is

1 negative (or the image forming device 400 stops the image
formation), the CPU 500 at step 1306 determines whether
the R/M enable flag is equal to "1". When the result at
the step 1306 is affirmative, the CPU 500 at step 1307
5 transmits a remote message through the DCD 420 to the CSS
460. The transmission of the remote message is carried
out by using a selecting of the DCD 420. After the step
1307 is performed, the CPU 500 at step 1308 resets the R/M
enable flag to "0" (or the OFF state). After the step
10 1308 is performed, the CPU 500 terminates the block
billing end process.

According to the block billing process and
the block billing end process in the above-described
embodiment, the image forming device 400 is set in the
15 remote message enable state only when the difference
between the current copy count and the received copy count
reaches an integral multiple of the remote message cycle.
The CPU 500 transmits a remote message to the CSS 460
after the image forming device 400 is set in the remote
20 message enable state. It is possible for the image
forming device management system of the present embodiment
to efficiently carry out a precise block billing function.

FIG. 58 shows another data format of the
remote message transmitted between the PI 509 and the
25 image forming device 400 when the step 1307 in the block

1 billing process of FIG. 56 is performed. The data format
of the remote message is essentially the same as that of
the remote message of FIG. 57.

5 As shown in FIG. 58, the record 1402(1) of
this remote message is the same as that of the remote
message of FIG. 57. A parameter code 1406 of the record
1402(2) indicates a kind of an operating parameter (or the
current copy count). The number of digits 1407 of the
record 1402(2) is set at "08" in ASCII code. A data 1408
10 of the record 1402(2) is set at the current copy count.
The records 1402(3) through 1402(N) may be omitted if they
are not needed.

A description of the data formats of a
remote message transmitted between the PI 509 and the DCD
15 420 and a remote message transmitted between the DCD 420
and the CSS 460 will be omitted. Similar to the data
format of the remote message of FIG. 58, the data formats
of these remote messages may be defined.

4.8 DISPLAY OF USER-PROGRAM MODE INDICATION

20 In the present embodiment, at least one of
the current copy count, the contract start copy count (or
the block billing start copy count) and the contract end
copy count (or the block billing end copy count) is
displayed on the character display part 702 in the control
25 panel 701 of the image forming device 400. It is possible

1 for the present embodiment to provide an easy-to use
management operation for the user of the image forming
device 400.

FIG. 59 shows a user-program mode
5 indication (or a block billing indication) displayed on
the character display part 702 in the control panel 701 of
the image forming device 400.

The image forming device 400 in the present
embodiment may be shifted to a user-program mode, and
10 during the user-program mode the user can perform a
setting of a special operating parameter of the image
forming device 400 which cannot be performed in the image
formation mode. For example, the image formation mode of
the image forming device 400 may be shifted to the user-
15 program mode when the user manually inputs a secret number
to the CPU 500 by pressing the ten keys 710, the
clear/stop key 711, the enter key 712 and/or the
preheat/mode clear key 714. Alternatively, a block
billing key for the above purpose may be provided in the
20 control panel 701 of the image forming device 400 or may
be displayed on the character display part 702 of the
image forming device 400.

In the example of the block billing
indication shown in FIG. 59, the current copy count and
25 the contract end copy count are displayed on the character

1 display part 702 in the control panel 701 of the image
forming device 400. The current copy count and the
contract end copy count are read from the non-volatile RAM
504 by the CPU 500, and they are transmitted through a
5 display control part (not shown) to the character display
part 702 by the CPU 500, so that the block billing
indication is displayed.

5. FIFTH EMBODIMENT

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10 The present embodiment of the image forming
device management system is characterized in that the CSS
460 transmits a parameter code, indicating a kind of a
particular one of the operating parameters, through the
DCD 420 to the image forming device 400, and the image
forming device 400 determines, in response to an access
15 request, an absolute address of the memory of the image
forming device 400 by the parameter code, and accesses the
particular one of the operating parameters in the memory
at the absolute address.

20 The present embodiment is characterized in
that the image forming devices are of different models and
share a common parameter code indicating an identical kind
for the operation parameters of the individual image
forming devices regardless of the model of each image
forming device.

25 In the present embodiment, the structure of

1 the image forming device management system, the structure
of the image forming device 400, the structure of the DCD
420, the structure of the CSS 460, the communication
sequences, and the data format of messages are essentially
5 the same as corresponding elements of the previous
embodiment described in the above sections 4.1 through
4.6. A description will now be given of only features of
the fifth embodiment of the image forming device
management system which are different from those of the
10 previous embodiment.

5.1 STRUCTURE OF SYSTEM

FIG. 60 shows a fifth embodiment of the
image forming device management system.

The system of FIG. 60 is different from the
15 system of FIG. 44 in that two DCD devices 420 and 421 are
provided, one group 400 of image forming devices 401 and
402 is connected through the DCD 420 to the CSS 460, and
another group 410 of image forming devices 411 through 413
is connected through the DCD 421 to the CSS 460.

20 Hereinafter, one of these image forming devices will be
called the image forming device 400 or the copier 400 for
the sake of convenience. Other structure of the system of
FIG. 60 are essentially the same as that of the system of
FIG. 44. The elements of the system of FIG. 60 which are
25 the same as corresponding elements in FIG. 44 are

1 designated by the same reference numerals, and a
description thereof will be omitted.

5.2 MEMORY ADDRESS

5 In the image forming device 400, a
parameter code table is stored in the ROM 502. In
accordance with the data format of the message shown in
FIG. 54, respective memory addresses of the ROM 502 for
storing the operating parameters of the image forming
device 400 are predetermined. In the parameter code
10 table, respective parameter codes corresponding to the
memory addresses of the ROM 502 are provided, and each
parameter code indicates a kind of a particular one of the
operating parameters.

FIG. 61 shows a parameter code stored in
15 the ROM 502 of the image forming device 400. In the
present embodiment, the image forming devices are of
different models and share a common parameter code
indicating an identical kind for the operation parameters
of the individual image forming devices regardless of the
20 model of each image forming device.

5.3 COMMUNICATION SEQUENCES

FIG. 62A and FIG. 62B show respective
communication sequences when a read request and a write
request are transmitted to the image forming device 400 of
25 concern by the CSS 460.

1 In each of the read request (FIG. 62A) and
the write request (FIG. 62B), the copier 400 of concern
receives an access request sent by the CSS 460. By making
reference to the parameter code table of the ROM 502 by a
5 parameter code of the access request, the copier 400
determines an absolute address of the memory of the copier
400 by the parameter code, and accesses a particular one
of the operating parameters in the memory at the absolute
address. In the case of the read request, the copier 400
10 reads out the operating parameter from the memory at the
absolute address, and transmits the read data through the
DCD 420 to the CSS 460. In the case of the write request,
the copier 400 writes data of the write request to the
memory at the absolute address, and transmits the written
15 data through the DCD 420 to the CSS 460.

5.4 CONTROL PROCESS OF COPIER

5.4.1 MAIN CONTROL PROCESS

FIG. 63 shows a main control process
performed by the CPU 500 of the image forming device 400
20 when an access request is transmitted to the image forming
device 400 by the CSS 460. The main control process of
FIG. 63 is essentially the same as the process of FIG. 20
except that the step S41 of the process of FIG. 20 is
eliminated from the main control process of FIG. 63.

25 5.4.2 READ SUB-PROCESS

1 FIG. 64 shows a read sub-process S636 in
the main control process of FIG. 63. As shown in FIG. 64,
the CPU 500 at step S641 gets a parameter code from the
received read request. The CPU 500 makes reference to the
5 parameter code table of the ROM 502 of the copier 400 by
the parameter code. The CPU 500 at step S642 determines
whether the received parameter code matches the parameter
code table of the ROM 502. When the received parameter
code matches the parameter code table, the CPU 500 at step
10 S643 determines whether the received parameter code
indicates a readable operating parameter by detecting a
corresponding item of the parameter code in the parameter
code table. When the received parameter code indicates a
readable operating parameter, the CPU 500 at step S644
15 determines a memory address from the parameter code of the
received read request by detecting a corresponding item of
the parameter code in the parameter code table. The CPU
500 at step S645 transmits the data, read from the memory
at the memory address, to the DCD 420. When the received
20 parameter code does not indicate a readable operation
parameter, the CPU 500 at step S646 transmits an error
code to the DCD 420.

5.4.3 WRITE SUB-PROCESS

25 FIG. 65 shows a write sub-process S637 in
the main control process of FIG. 63. As shown in FIG. 65,

1 the CPU 500 at step S651 gets a parameter code from the
received write request. The CPU 500 makes reference to
the parameter code table of the ROM 502 of the copier 400
by the parameter code. The CPU 500 at step S652
5 determines whether the received parameter code matches the
parameter code table of the ROM 502. When the received
parameter code matches the parameter code table, the CPU
500 at step S653 determines whether the received parameter
code indicates a writable operating parameter by detecting
10 a corresponding item of the parameter code in the
parameter code table. When the received parameter code
indicates a writable operating parameter, the CPU 500 at
step S654 gets a writing data from the received write
request. The CPU 500 at step S655 determines whether the
15 writing data is in an effective data range. When the
writing data is in the effective data range, the CPU 500
at step S656 determines a memory address from the
parameter code of the received write request by detecting
a corresponding item of the parameter code in the
20 parameter code table. The CPU 500 at step S657 writes the
writing data to the memory at the memory address. The CPU
500 at step S658 transmits the written data (or the
operating parameter), which is written to the memory at
the memory address, to the DCD 420. When the received
25 parameter code does not indicate a writable operation

1 parameter, the CPU 500 at step S659 transmits an error
code to the DCD 420. When the writing data is not in the
effective data range, the CPU 500 performs the step S659.

6. SIXTH EMBODIMENT

5 The present embodiment of the image forming
device management system is characterized in that the CSS
460 can manage an accurate maintenance service start time
of each of the image forming devices 400. In the present
embodiment, the basic structure of the image forming
10 device management system is essentially the same as that
of the previous embodiment described in the above sections
4.1 through 4.6. A description will now be given of only
features of the sixth embodiment of the image forming
device management system which are different from those of
15 the previous embodiment.

6.1 CONTROL PANEL

FIG. 66 shows a control panel of the image
forming device 400 in the present embodiment. As shown in
FIG. 66, the control panel includes ten keys 71, a
20 clear/stop key 72, a print key 73, an enter key 74, an
interrupt key 75, a preheat/mode clear key 76, a mode
check key 77, a screen change key 78, a call key 79, a
registration key 80, a guidance key 81, a display contrast
volume 82, and a character display part 83.

25 The character display part 83 is prepared

1 by using full-dot liquid crystal display elements with a
matrix touch-panel switch of a transparent sheet material
attached thereto. In the matrix touch-panel switch, a
number of touch sensors (provided for each of 8 x 8
5 picture elements) are internally provided. A key of the
character display part 83 is turned ON or OFF by pressing
or touching it. When a power switch of the copier 400 is
turned ON, an image formation mode (copy mode) indication
is displayed on the character display part 83. In
10 addition, indication of an operating state of the image
forming device 400, such as "copy possible", "during
coping" or "no paper", is displayed on the character
display part 83 of the image forming device 400.

FIG. 67 shows an image formation mode
15 indication (or a copy mode indication) displayed on a
character display part 83 of the control panel of the
image forming device of FIG. 66.

As shown in FIG. 67, the copy mode
indication includes a message display area 91, a set
20 display area 92, a tray selection key/copy size display
area 93, an auto sheet selection (ASS) key 94, a density
adjusting key 95, an auto density selection (ADS) key 96,
an equal-size (E/S) key 97, an enlarge (E/L) key 98, and a
reduce (R/D) key 99.

25 Further, in the copy mode indication of

1 FIG. 67, a zoom key 83-100, a sheet-designated sizing
(SDS) key 83-101, a set of duplex mode keys 83-102, a
duplex mode message area 83-103, a pair of page-offset
(P/O) keys 83-104, a page-offset mode message area 83-105,
5 a shift function select key 83-106, a staple select key
83-107 (one place), a staple select key 83-108 (two
places), and a maintenance end message key 83-109. When
requesting a transmission of a maintenance end message to
the CSS 460, the maintenance end message key 83-109 is
10 pressed or turned ON by the user. The maintenance end
message key 83-109 may be displayed only when needed, and
it may be eliminated when unneeded. In addition, the
maintenance end message key 83-109 may be displayed only
when the copier 400 is shifted to a service program mode,
15 which will be described below.

6.2 SERVICE PROGRAM MODE PROCESS

Each image forming device 400 in the
present embodiment may be shifted to a service program
mode, and during the service program mode a serviceman can
20 perform a maintenance service of the image forming device
400, such as setting or adjustment of the operating
parameters of the image forming device 400 or displaying
of the statistical data of the image forming device 400,
which cannot be performed in the image formation mode.
25 For example, the image forming device 400 may be shifted

1 into the service program mode when the serviceman manually
inputs a secret number (not available to the user) to the
CPU 500 by pressing the ten keys 71 and/or the enter key
74 in a predetermined sequence.

5 FIG. 68 shows a service program (SP) mode
indication displayed on the character display part 83 of
the control panel of the image forming device of FIG. 66
during the service program mode.

As shown in FIG. 68, the service program
10 (SP) mode indication on the character display part 83
includes an adjust mode shift key 111, a test mode shift
key 112, a data output mode shift key 113, a special
specification set mode shift key 114, a remote message
test mode shift key 115, and a counter mode shift key 116.

15 In the present embodiment, when the ten
keys 71 and/or the enter key 74 of the control panel of
the image forming device 400 are pressed or turned ON in a
predetermined sequence by a serviceman, the image forming
device 400 is shifted to the service program mode. When
20 the image forming device 400 is shifted to the service
program mode, the service program mode indication
(including a maintenance end message key) is displayed on
the character display part 83 as shown in FIG. 68. At the
same time, the image forming device 400 automatically
25 transmits a maintenance service start message through the

1 DCD 420 to the CSS 460. The maintenance service start
message notifies the CSS 460 of the start of a maintenance
service of the image forming device 400 by the serviceman.
FIG. 74A shows a data format of the maintenance service
5 start message transmitted to the CSS 460 by the image
forming device 400.

During the service program mode, the
maintenance service of the image forming device 400 is
performed by the serviceman. When the maintenance service
10 is complete, the maintenance end message key of the
service program mode indication on the character display
part 83 by the serviceman. At this time, the image
forming device 400 automatically transmits a maintenance
service end message through the DCD 420 to the CSS 460.
15 The maintenance service end message notifies the CSS 460
of the end of the maintenance service of the image forming
device 400 by the serviceman. FIG. 74B shows a data
format of the maintenance service end message transmitted
to the CSS 460 by the image forming device 400.

20 According to the present embodiment, the
CSS 460 can manage an accurate maintenance service
start/end time of each of the image forming devices 400.

6.3 SERVICE PROGRAM MODE SHIFT CHECK PROCESS

FIG. 69 shows a maintenance service start
25 message process performed by the CPU 500 of the image

1 forming device 400 in the present embodiment.

As shown in FIG. 69, the CPU 500 at step S691 determines whether a service program mode shift key is pressed or turned ON by the serviceman (or determines
5 whether the ten keys 71 and/or the enter key 74 of the control panel of the image forming device 400 are pressed or turned ON in the predetermined sequence by the serviceman). When the result at the step S691 is affirmative, the CPU 500 at step S692 shifts the image
10 forming device 400 to the service program mode. In the step S692, the CPU 500 displays the service program mode indication as shown in FIG. 68 on the character display part 83 of the control panel. In the present embodiment, the service program mode indication includes the
15 maintenance end message key (not shown in FIG. 68).

After the step S692 is performed, the CPU 500 at step S693 determines whether a maintenance run flag is equal to "1". When the result at the step S693 is negative (or the maintenance run flag = "0"), the CPU 500
20 at step S694 transmits a maintenance service start message through the DCD 420 to the CSS 460. The maintenance service start message notifies the CSS 460 of the start of the maintenance service of the image forming device 400. After the step S694 is performed, the CPU 500 at step S695
25 sets the maintenance run flag to "1". After the step S695

1 is performed, the CPU 500 ends the maintenance service
start message process of FIG. 69.

When the result at the step S693 is
affirmative (the maintenance run flag = "1"), the CPU 500
5 ends the maintenance service start message process of FIG.
69. Hence, at this time, the CPU 500 inhibits the
automatic transmission of the maintenance service start
message to the CSS 460. In this case, the automatic
transmission of the maintenance service start message is
10 already performed but the service program mode shift key
mentioned above is pressed or turned ON again by the
serviceman. Also, the automatic transmission of a
maintenance service end message is not yet performed by
pressing the maintenance end message key. Hence, it is
15 possible for the image forming device management system of
the present embodiment to manage an accurate maintenance
service start time of the image forming device 400.

6.4 MAINTENANCE SERVICE END MESSAGE PROCESS

FIG. 70 shows a maintenance service end
20 message process performed by the CPU 500 of the image
forming device 400 in the present embodiment. The
maintenance service end message process of FIG. 70 is
initiated when the maintenance end message key of the
service program mode indication on the character display
25 part 83 is pressed or turned ON by the serviceman.

1 As shown in FIG. 70, the CPU 500 at step
S702 transmits a maintenance service end message through
the DCD 420 to the CSS 460. After the step S701 is
performed, the CPU 500 at step S702 resets the maintenance
5 run flag to "0". The image forming device management
system of the present embodiment can prevent the
maintenance of a maintenance service end time from being
degraded even when the serviceman fails to request the
transmission of the maintenance service end message to the
10 CSS 460. Hence, it is possible for the image forming
device management system of the present embodiment to
manage an accurate maintenance service end time of each of
the image forming devices 400.

6.5 MAINTENANCE SERVICE START MESSAGE PROCESS

15 FIG. 71 shows a maintenance service start
message key displayed on the character display part 83 of
the control panel of the image forming device 400.

In the present embodiment, when the ten
keys 71 and/or the enter key 74 of the control panel of
20 the image forming device 400 are pressed or turned ON in a
predetermined sequence by a serviceman, the maintenance
service start indication (including the maintenance start
message key 120) is displayed on the character display
part 83 as shown in FIG. 71. When the maintenance start
25 message key 120 in the maintenance service start

1 indication, displayed on the character display part 83, is
pressed or turned ON by the serviceman, the image forming
device 400 is shifted to the service program mode. When
the image forming device 400 is shifted to the service
5 program mode, the service program mode indication
(including the maintenance end message key) is displayed
on the character display part 83 as shown in FIG. 68. At
the same time, the image forming device 400 automatically
transmits a maintenance service start message through the
10 DCD 420 to the CSS 460. For example, FIG. 74A shows a
data format of the maintenance service start message
transmitted to the CSS 460 by the image forming device 400
at this time. The maintenance service start message
notifies the CSS 460 of the start of the maintenance
15 service of the image forming device 400 by the serviceman.
It is possible for the image forming device management
system of the present embodiment to manage an accurate
maintenance service start time of each of the image
forming devices 400.

20 During the service program mode, the
maintenance service of the image forming device 400 is
performed by the serviceman. When the maintenance service
is complete, the maintenance end message key of the
service program mode indication on the character display
25 part 83 is pressed or turned ON by the serviceman. At

1 this time, the image forming device 400 automatically
transmits a maintenance service end message through the
DCD 420 to the CSS 460. The maintenance service end
message notifies the CSS 460 of the end of the maintenance
5 service of the image forming device 400 by the serviceman.
For example, FIG. 74B shows a data format of the
maintenance service end message transmitted to the CSS 460
by the image forming device 400 at this time.

According to the present embodiment, the
10 CSS 460 can manage an accurate maintenance service
start/end time of each of the image forming devices 400.

FIG. 72 shows a maintenance service start
message process performed by the CPU 500 of the image
forming device 400 in the present embodiment.

15 As shown in FIG. 72, the CPU 500 at step
S721 determines whether the service program mode shift key
is pressed or turned ON by the serviceman (or determines
whether the ten keys 71 and/or the enter key 74 of the
control panel of the image forming device 400 are pressed
20 or turned ON in the predetermined sequence by the
serviceman). When the result at the step S721 is
affirmative, the CPU 500 at step S722 determines whether
the maintenance run flag is equal to "1".

When the result at the step S722 is
25 negative (or the maintenance run flag = 0), the CPU 500 at

1 step S723 displays the maintenance service start
indication of FIG. 71 on the character display part 83.
As described above, the maintenance service start
indication includes the maintenance start message key 120.
5 After the step S723 is performed, the CPU 500 at step S724
determines whether the maintenance start message key 120
is pressed or turned ON by the serviceman. When the
maintenance start message key 120 is turned ON, the CPU
500 at step S725 transmits the maintenance service start
10 message through the DCD 420 to the CSS 460. After the
step S725 is performed, the CPU 500 at step S726 sets the
maintenance run flag to "1". After the step S726 is
performed, the CPU 500 performs step S727 which will be
described below.

15 When the result at the step S721 is
negative (or the service program mode shift key is not
turned ON), the CPU 500 performs step S727 which will be
described below, and does not perform the steps S723-S726.

When the result at the step S722 is
20 affirmative (or the maintenance run flag = "1"), the CPU
500 at step S727 shifts the image forming device 400 into
the service program mode. In the step S727, the CPU 500
displays the service program mode indication of FIG. 68 on
the character display part 83 of the control panel. In
25 the present embodiment, the service program mode

1 indication includes the maintenance end message key (not
shown in FIG. 68). After the step S727 is performed, the
CPU 500 ends the maintenance service start message process
of FIG. 72. Hence, the CPU 500 inhibits the automatic
5 transmission of the maintenance service start message to
the CSS 460 when the maintenance run flag is equal to "1".
In this case, the automatic transmission of the
maintenance service start message is already performed but
the service program mode shift key mentioned above is
10 pressed or turned ON again by the serviceman. Also, the
automatic transmission of a maintenance service end
message is not yet performed by pressing the maintenance
end message key. Accordingly, it is possible for the
image forming device management system of the present
15 embodiment to manage an accurate maintenance service start
time of each of the image forming devices 400.

6.6 MAINTENANCE SERVICE END KEY CHECK PROCESS

As described above, during the service
program mode, the maintenance service of the image forming
20 device 400 is performed by the serviceman. When the
maintenance service is complete, the maintenance end
message key of the service program mode indication on the
character display part 83 is pressed or turned ON by the
serviceman. At this time, the image forming device 400
25 automatically transmits a maintenance service end message

1 through the DCD 420 to the CSS 460. The maintenance
service end message notifies the CSS 460 of the end of the
maintenance service of the image forming device 400 by the
serviceman.

5 In the present embodiment, only when the
maintenance run flag is set to "1", the maintenance end
message key of the service program mode indication is
displayed on the character display part 83.

FIG. 73 shows a maintenance service end
10 message process performed by the CPU 500 of the image
forming device 400 in the present embodiment.

As shown in FIG. 73, the CPU 500 at step
S731 determines whether the maintenance run flag is equal
to "1". When the result at the step S731 is negative (or
15 the maintenance run flag = 0), the CPU 500 at step S732
eliminates the maintenance end message key from the
character display part 83, regardless of the current
condition of the service program mode indication displayed
on the character display part 83. After the step S732 is
20 performed, the CPU 500 ends the maintenance service end
message process of FIG. 73. Hence, when the maintenance
run flag is equal to "0", the automatic transmission of
the maintenance service end message is inhibited.

When the result at the step S731 is
25 affirmative (or the maintenance run flag = 1), the CPU 500

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1 at step S733 displays the maintenance end message key on
the character display part 83, regardless of the current
condition of the service program mode indication displayed
on the character display part 83. After the step S733 is
5 performed, the CPU 500 at step S734 determines whether the
maintenance end message key is pressed or turned ON by the
serviceman.

When the result at the step S734 is
negative, the CPU 500 ends the maintenance service end
10 message process of FIG. 73. On the other hand, when the
result at the step S734 is affirmative, the CPU 500 at
step S735 transmits the maintenance service end message
through the DCD 420 to the CSS 460. After the step S735
is performed, the CPU at step S736 resets the maintenance
15 run flag to "0". After the step S736 is performed, the
CPU 500 ends the maintenance service end message process
of FIG. 73. Hence, it is possible for the image forming
device management system of the present embodiment to
manage an accurate maintenance service end time of each of
20 the image forming devices 400.

Further, the present invention is not
limited to the above-described embodiments, and variations
and modifications may be made without departing from the
scope of the present invention.

1 WHAT IS CLAIMED IS:

5

1. An image forming device management
system including:

 a plurality of image forming devices;

 a central service station for providing a
10 maintenance service for the image forming devices; and

 a communication control unit connected to
each of the image forming devices by a signal line, the
communication control unit connecting one of the image
forming devices to the central service station via a
15 communication network,

 wherein each of the image forming devices
comprises message means for outputting a signal line
separation message when the image forming device has no
signal from the central service station or the
20 communication control unit over a predetermined period.

25

2. The system according to claim 1,

1 wherein each of the image forming devices comprises
detection means for detecting that the image forming
device has no signal from the communication control unit
over the predetermined period, based on a response of the
5 image forming device to a selecting of the communication
control unit to the image forming device.

10

3. The system according to claim 1,
wherein each of the image forming devices comprises
detection means for detecting that the image forming
device has no signal from the central service station over
15 the predetermined period, based on a response of the image
forming device to a selecting of the central service
station to the image forming device.

20

4. The system according to claim 1,
wherein each of the image forming devices comprises
detection means for detecting that the image forming
25 device has no signal from the communication control unit

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1 over the predetermined period, based on a response of the
image forming device to a polling of the communication
control unit to the image forming device.

5

5. The system according to claim 1,
wherein each of the image forming devices includes a
10 communication interface unit having a terminal connected
to the communication control unit, and each of the image
forming devices comprises detection means for detecting
that the image forming device has no signal from the
communication control unit over the predetermined period,
15 based on a detected voltage of the terminal of the
communication interface unit.

20

6. The system according to claim 1,
wherein each of the image forming devices includes a
connection detecting circuit having an input connected to
the communication control unit, and each of the image
25 forming devices comprises detection means for detecting

1 that the image forming device has no signal from the
communication control unit over the predetermined period,
based on an output of the connection detecting circuit.

5

7. The system according to claim 1,
wherein the signal line separation message output by the
10 message means indicates a separation of the signal line
between the image forming device and the communication
control unit.

15

8. An image forming device management
system including:

a plurality of image forming devices;
20 a central service station for providing a
maintenance service for the image forming devices; and
a communication control unit connected to
each of the image forming devices, the communication
control unit connecting one of the image forming devices
25 to the central service station via a communication

1 network,

wherein each of the image forming devices
comprises:

jam detection means for detecting a jam of
5 the image forming device;

image formation detection means for
detecting a normal end of image formation by the image
forming device;

remote message means for transmitting a
10 first remote message through the communication control
unit to the central service station, the first remote
message indicating that the jam of the image forming
device is continuously detected for a predetermined number
of copy sheets before the normal end of image formation by
15 the image forming device is detected; and

remote message inhibition means for
inhibiting the remote message means from transmitting a
subsequent remote message after the transmission of the
first remote message until the normal end of image
20 formation by the image forming device is detected.

25

9. An image forming device management

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1 system including:

a plurality of image forming devices;

a central service station for providing a
maintenance service for the image forming devices; and

5 a communication control unit connected to
each of the image forming devices, the communication
control unit connecting one of the image forming devices
to the central service station via a communication
network,

10 wherein each of the image forming devices
comprises:

jam detection means for detecting a jam of
the image forming device;

image formation detection means for
15 detecting a normal end of image formation by the image
forming device;

remote message means for transmitting a
remote message through the communication control unit to
the central service station, the remote message indicating
20 that the jam of the image forming device is continuously
detected for a predetermined number of copy sheets before
the normal end of image formation by the image forming
device is detected;

a time counter for outputting a time count
25 indicating a period of the jam of the image forming

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1 device; and

remote message inhibition means for
inhibiting the remote message means from transmitting the
remote message when the time count output by the time
5 counter exceeds a predetermined value.

10 10. The system according to claim 9,
wherein each of the image forming devices further
comprises:

setting means for setting the remote
message inhibition means in one of an ON state and an OFF
15 state; and

time count resetting means for resetting
the time counter to zero when the remote message
inhibition means is set from the OFF state into the ON
state by the setting means.

20

11. An image forming device management
25 system including:

1

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25

1 means for transmitting a serviceman request
through the communication device to the central service
station when the image forming device requires a
serviceman service; and

5 request inhibition means for inhibiting
said means from transmitting the serviceman request when
the serviceman visit flag retained by the memory indicates
that the maintenance service of the image forming device
is initiated.

10

13. The system according to claim 11,
15 wherein each of the image forming devices further
comprises:

statistical data storage means for storing
statistical data including a continuous jam count output
by a continuous jam counter, a long-period jam time count
20 output by a long-period jam counter, and a door-open time
count output by a door-open time counter; and

means for initializing the statistical data
of the statistical data storage means when the serviceman
visit flag retained by the memory indicates that the
25 maintenance service of the image forming device is

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1 terminated.

5

14. The system according to claim 11,
wherein each of the image forming devices further
comprises means for controlling the remote message means
to transmit a remote message indicating an end of the
10 maintenance service, to the central service station when
the remote message means does not transmit the remote
message over a predetermined period after a start of the
maintenance service of the image forming device by the
serviceman.

15

15. An image forming device management
20 system including:

a plurality of image forming devices;
a central service station for providing a
maintenance service for the image forming devices; and
a communication device for connecting one
25 of the image forming devices to the central service

1 station via a communication network,

wherein each of the image forming devices
comprises:

receiving means for receiving a non-
5 resettable copy count and a remote message cycle, both
transmitted to the image forming device by the central
service station through the communication device, the copy
count indicating a predetermined number of copy sheets
with respect to a contract for use of the image forming
10 device, the remote message cycle indicating a frequency at
which the image forming device transmits a remote message
to the central service station;

first storage means for storing the copy
count and the remote message cycle received by the
15 receiving means;

second storage means for storing a current
copy count that is incremented every time an image
formation of one copy sheet is performed by the image
forming device;

20 control means for setting the image forming
device in a remote message enable state when a difference
between the current copy count and the received copy count
reaches an integral multiple of the remote message cycle;
and

25 remote message means for transmitting the

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1 remote message through the communication device to the
central service station after the image forming device is
set in the remote message enable state by the control
means.

5

16. The system according to claim 15,
10 wherein the remote message transmitted to the central
service station by the remote message means includes a
remote message purpose and the current copy count.

15

17. The system according to claim 15,
wherein the copy count received by the receiving means
indicates a predetermined number of copy sheets at a start
20 of a block billing contract for use of the image forming
device.

25

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1 18. The system according to claim 15,
wherein the copy count received by the receiving means
indicates a predetermined number of copy sheets at an end
of a block billing contract for use of the image forming
5 device.

10 19. The system according to claim 15,
wherein each of the image forming devices includes an
operational display device, at least one of a copy count
at a start of a block billing contract for use of the
image forming device, a copy count at an end of the block
15 billing contract, and the difference between the current
copy count and the received copy count being displayed on
the operational display device.

20

 20. The system according to claim 15,
wherein each of the image forming devices includes an
operational display device, the difference between the
25 current copy count and the received copy count being

1 displayed on the operational display device.

5

21. An image forming device management system including:

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10 a plurality of image forming devices, each of the image forming devices having operating parameters stored in a memory of the image forming device, and absolute addresses of the memory where the respective operating parameters are stored being predetermined according to a kind of each operating parameter;

15 a central service station for reading information from or writing information to the operating parameters of one of the image forming devices by transmitting an access request to said one of the image forming devices; and

20 a communication device for connecting one of the image forming devices to the central service station via a communication network,

wherein the central service station comprises parameter code transmitting means for transmitting a parameter code, indicating a kind of a particular one of the operating parameters, through the

25

1 communication device to one of the image forming devices
when transmitting an access request to said one of the
image forming devices, and

wherein each of the image forming devices
5 comprises:

address determination means responsive to
the access request for determining an absolute address of
the memory of the image forming device in accordance with
the parameter code transmitted by said code transmitting
10 means; and

access request processing means for
accessing the particular one of the operating parameters
at the absolute address of the memory determined by the
address determination means.

15

22. The system according to claim 21,
20 wherein the image forming devices are of different models,
and share a common parameter code indicating an identical
kind for the operating parameters of the individual image
forming devices regardless of the model of each image
forming device.

25

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1 23. An image forming device management
system including:

 a plurality of image forming devices;
 a central service station for providing a
5 maintenance service for the image forming devices; and
 a communication device for connecting one
of the image forming devices to the central service
station via a communication network,

 wherein each of the image forming devices
10 comprises:

 first request means for outputting a mode
shift request to the image forming device, the mode shift
request initiating a shift of the image forming device to
a maintenance mode;

15 maintenance mode start means for setting
the image forming device in the maintenance mode in
response to the mode shift request output by the first
request means;

 first remote message means for transmitting
20 a first remote message through the communication device to
the central service station in response to the mode shift
request output by the first request means, the first
remote message indicating a start of a maintenance service
of the image forming device;

25 second request means for outputting a

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1 maintenance end request to the image forming device, the
maintenance end request terminating the maintenance mode
of the image forming device; and

second remote message means for
5 transmitting a second remote message through the
communication device to the central service station in
response to the maintenance end request output by the
second request means, the second remote message indicating
an end of the maintenance service of the image forming
10 device.

24. The system according to claim 23,
15 wherein each of the image forming devices further
comprises remote message inhibition means for inhibiting
the first remote message means from transmitting a remote
message through the communication device to the central
20 service station when a mode shift request is output again
by the first request means after the first remote message
is transmitted by the first remote message means and
before the second remote message is transmitted by the
second remote message means.

25

1 25. An image forming device management
system including:
 a plurality of image forming devices;
 a central service station for providing a
5 maintenance service for the image forming devices; and
 a communication device for connecting one
of the image forming devices to the central service
station via a communication network,
 wherein each of the image forming devices
10 comprises:
 first request means for outputting a mode
shift request to the image forming device,
 first display means for displaying a first
mode shift key in response to the mode shift request
15 output by the first request means,
 second request means for initiating a shift
of the image forming device to a maintenance mode when the
first mode shift key displayed by the first display means
is turned ON;
20 maintenance mode start means for setting
the image forming device in the maintenance mode when the
shift of the image forming device to the maintenance mode
is initiated by the second request means;
 first remote message means for transmitting
25 a first remote message through the communication device to

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1 the central service station when the shift of the image
forming device to the maintenance mode is initiated by the
second request means, the first remote message indicating
a start of a maintenance service of the image forming
5 device;

third request means for outputting a
maintenance end request to the image forming device, the
maintenance end request terminating the maintenance mode
of the image forming device; and

10 second remote message means for
transmitting a second remote message through the
communication device to the central service station in
response to the maintenance end request output by the
second request means, the second remote message indicating
15 an end of the maintenance service of the image forming
device.

20

26. The system according to claim 25,
wherein each of the image forming devices further
comprises display inhibition means for inhibiting the
first display means from displaying the first mode shift
25 key when a mode shift request is output again by the first

1 request means after the first remote message is
transmitted by the first remote message means and before
the second remote message is transmitted by the second
remote message means.

5

27. The system according to claim 25,
10 wherein each of the image forming devices further
comprises second display means for displaying a second
mode shift key after the first remote message is
transmitted by the first remote message means, the third
request means outputting the maintenance end request to
15 the image forming device when the second mode shift key
displayed by the second display means is turned ON.

20

28. The system according to claim 23,
wherein the communication device is a data communication
device connected to each of the image forming devices, the
data communication device connecting one of the image
25 forming devices to the central service station via a

1. communication network.

5

29. The system according to claim 23,
wherein the communication device comprises a communication
control unit connected to each of the image forming
devices, the communication control unit connecting one of
10 the image forming devices to the central service station
via a communication network.

15

20

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1 ABSTRACT OF THE DISCLOSURE

 An image forming device management system
includes a plurality of image forming devices, a central
service station which provides a maintenance service for
5 the image forming devices, and a communication control
unit which is connected to each of the image forming
devices by a signal line, the communication control unit
connecting one of the image forming devices to the central
service station via a communication network. In the
10 system, each of the image forming devices includes a
message unit which outputs a signal line separation
message when the image forming device has no signal from
the central service station or the communication control
unit over a predetermined period.

15

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FIG.1

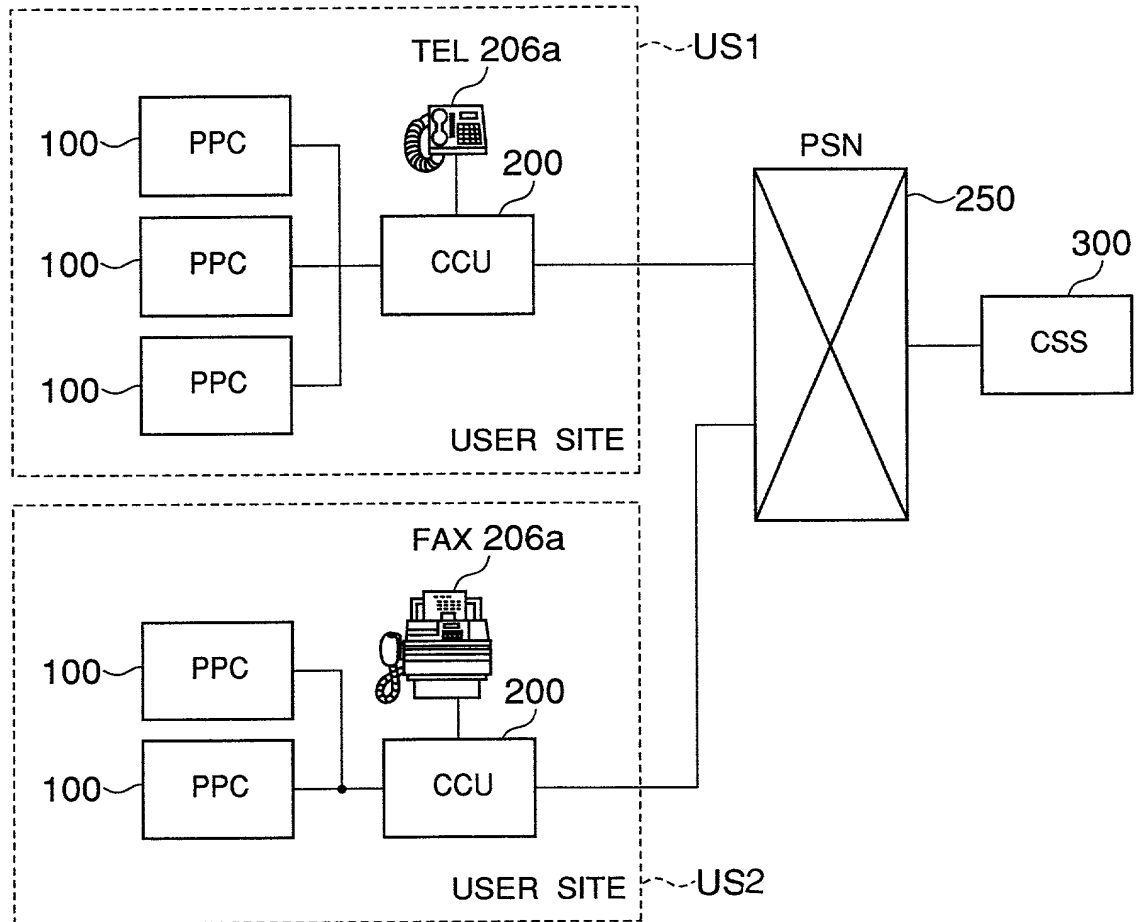


FIG.2

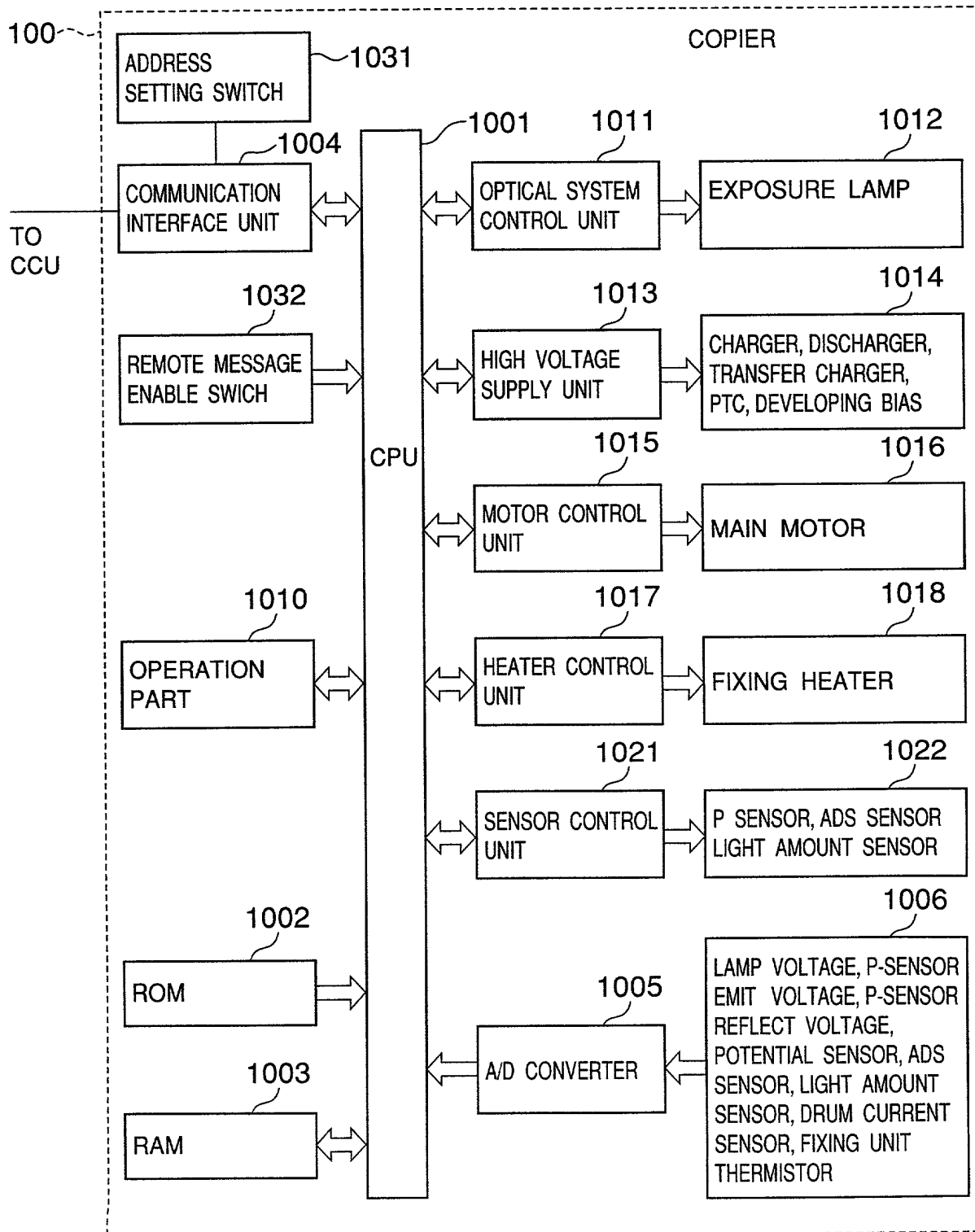


FIG.3

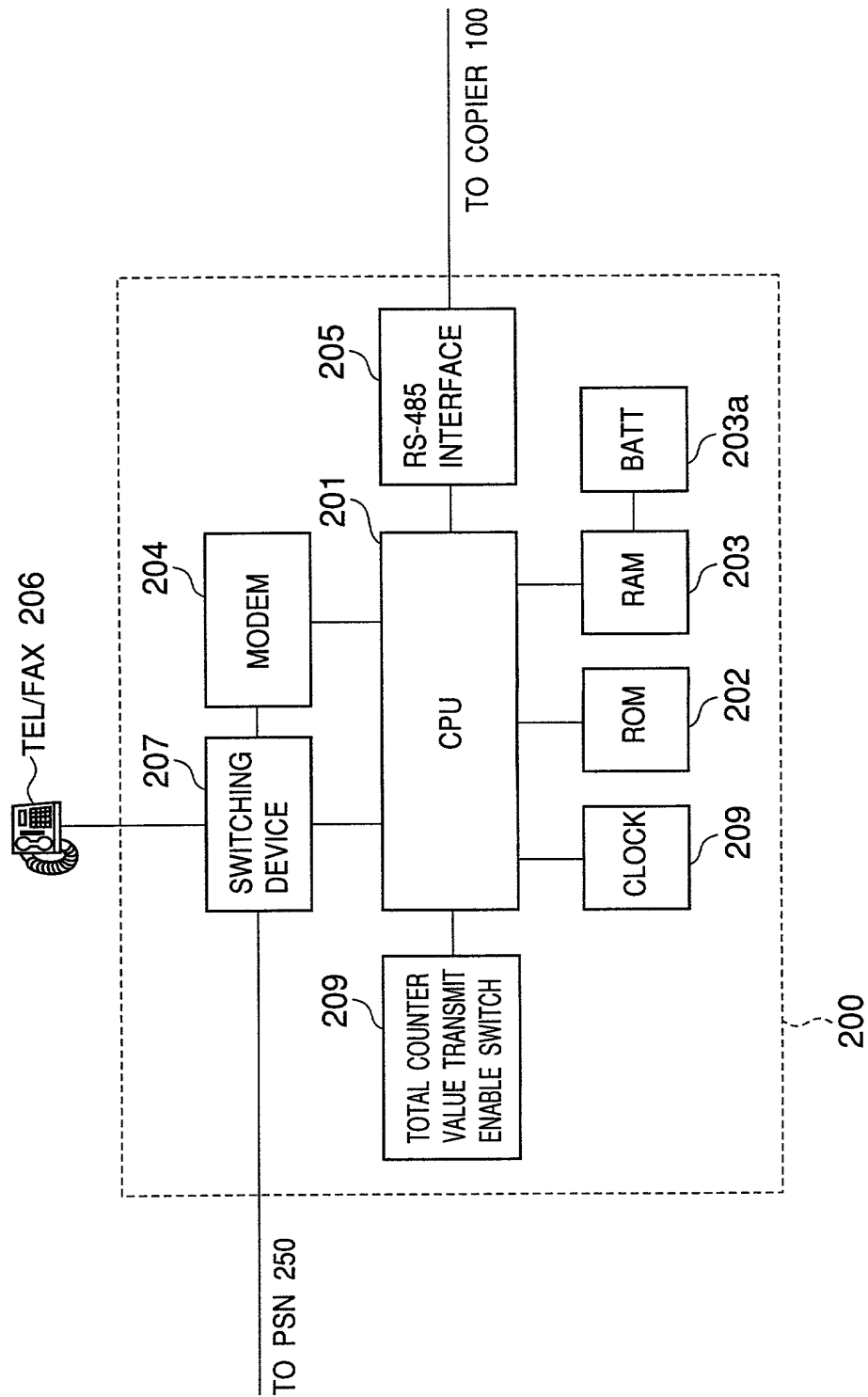


FIG.4

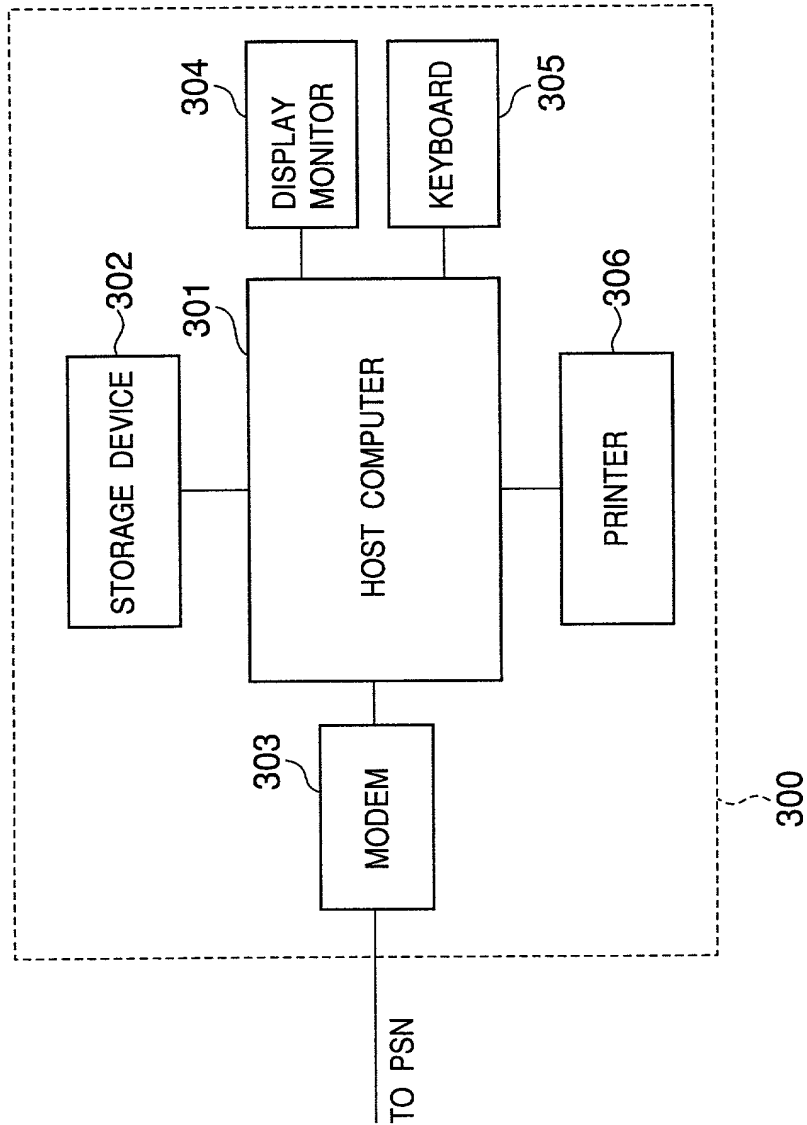


FIG.5

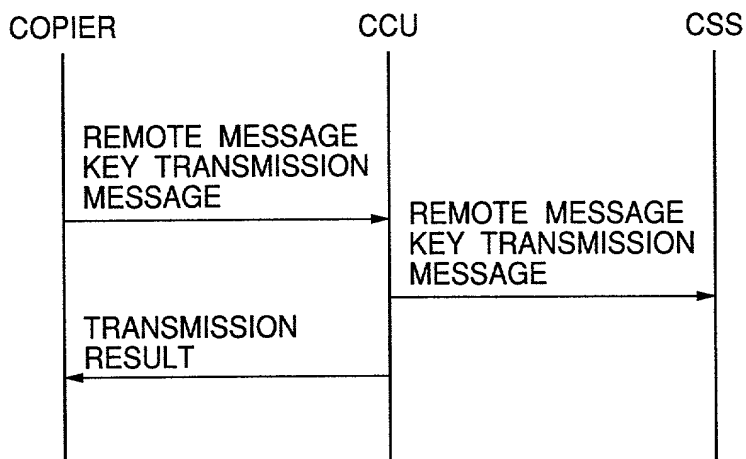


FIG.6

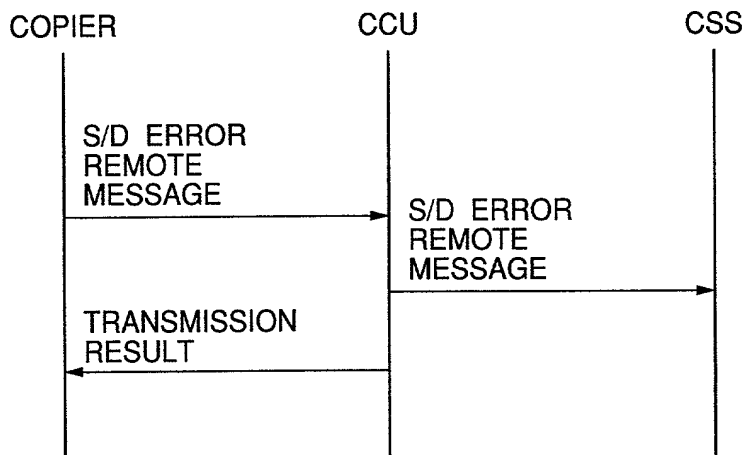


FIG.7

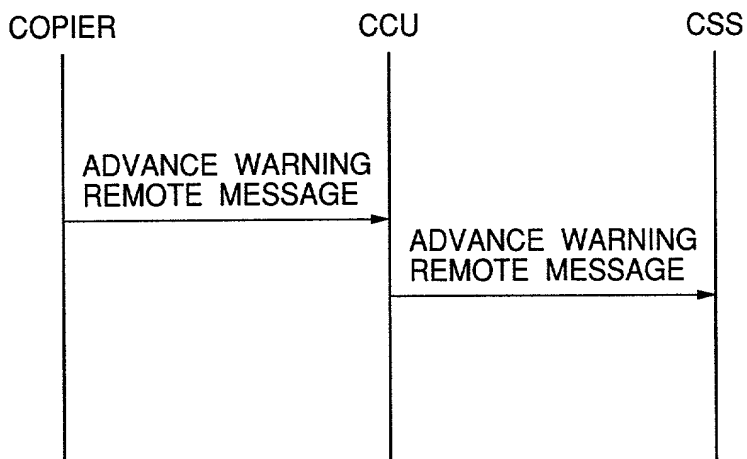


FIG.8A

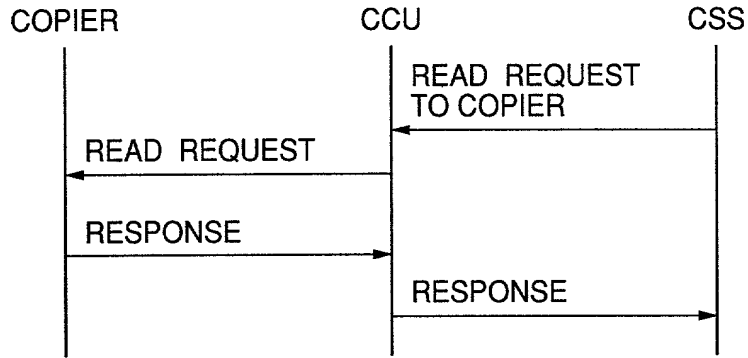


FIG.8B

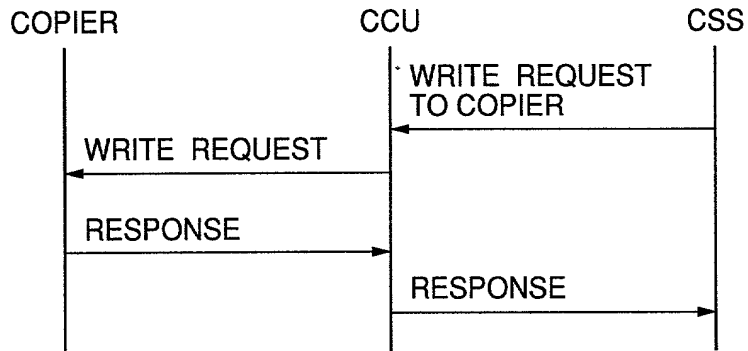


FIG.8C

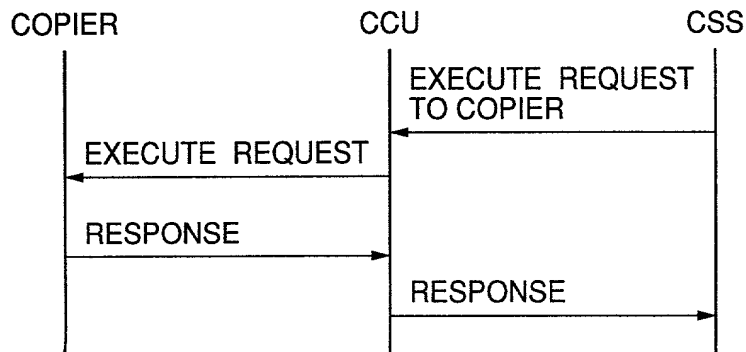


FIG.9A

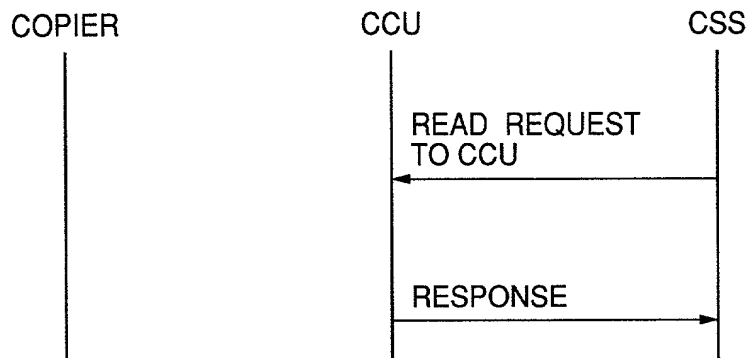


FIG.9B

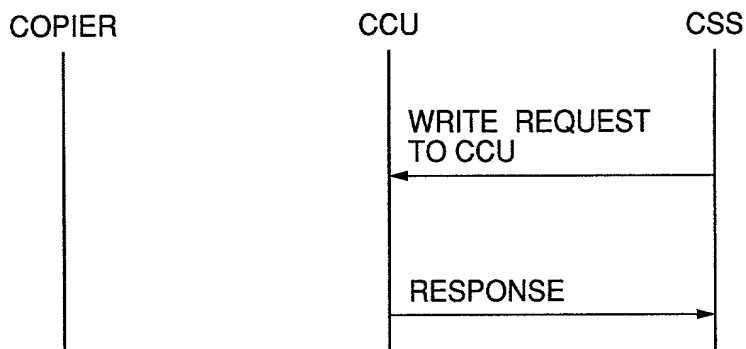


FIG.9C

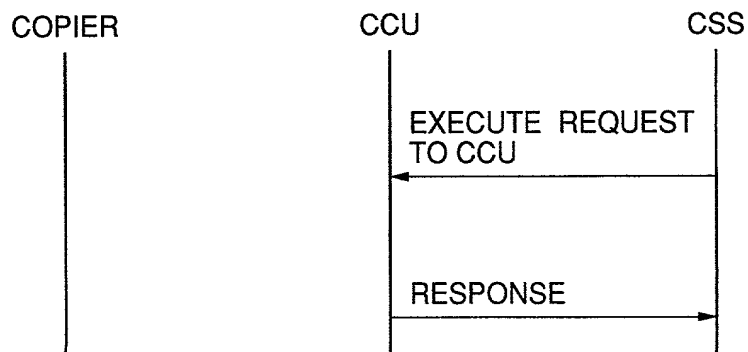


FIG.10

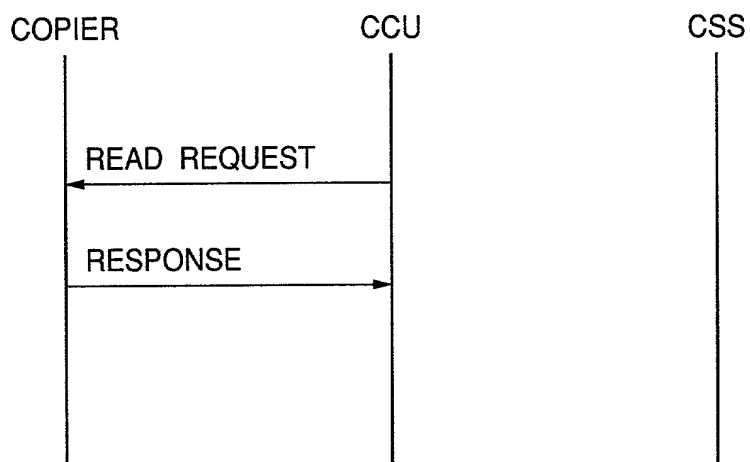


FIG.11

PARAMETERS		DATA LENGTH
ADDRESS-1 COPIER	MODEL NO.	6
	SERIAL NO.	10
	CHECK SUM.	4
ADDRESS-2 COPIER	MODEL NO.	6
	SERIAL NO.	10
	CHECK SUM.	4
ADDRESS-3 COPIER	MODEL NO.	6
	SERIAL NO.	10
	CHECK SUM.	4
ADDRESS-4 COPIER	MODEL NO.	6
	SERIAL NO.	10
	CHECK SUM.	4
ADDRESS-5 COPIER	MODEL NO.	6
	SERIAL NO.	10
	CHECK SUM.	4
REMOTE MESSAGE TRANSMISSION BY REMOTE MESSAGE KEY	DESTINATION TEL NO.	32
	NO. OF REDIALS	2
	REDIAL PERIOD	3
	CONDITIONS OF DATA TRANSMISSION TO	NO. OF JAMS 1
	CSS IN REMOTE	NO. OF S/D ERRORS 1
	MESSAGE TRANSMISSION	NO. OF COPIES 1
		STATE OF COPIER 1
	CHECK SUM	4
REMOTE MESSAGE TRANSMISSION BY SELF-DIAGNOSTIC ERROR	DESTINATION TEL NO.	32
	NO. OF REDIALS	2
	REDIAL PERIOD	3
	CONDITIONS OF DATA TRANSMISSION TO	NO. OF JAMS 1
	CSS IN REMOTE	NO. OF S/D ERRORS 1
	MESSAGE TRANSMISSION	NO. OF COPIES 1
		STATE OF COPIER 1
	CHECK SUM	4
REMOTE MESSAGE TRANSMISSION BY ADVANCE WARNING	DESTINATION TEL NO.	32
	NO. OF REDIALS	2
	REDIAL PERIOD	3
	CONDITIONS OF DATA TRANSMISSION TO	NO. OF JAMS 1
	CSS IN REMOTE	NO. OF S/D ERRORS 1
	MESSAGE TRANSMISSION	NO. OF COPIES 1
		STATE OF COPIER 1
	TIME OF NOTIFICATION	4
TOTAL COUNTER VALUE TRANSMIT PROCESS	CHECK SUM	4
	TIME OF TOTAL COUNTER VALUE COLLECTION	4
	DESTINATION TEL NO.	32
	DATE AND TIME OF TRANSMISSION	6
SETTING OF TELEPHONE	CHECK SUM	4
	DIAL MODE SETTING(PULSE OR TONE)	1
	DIAL PULSE PERIOD	1
	CHECK SUM	4

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FIG.12A

MESSAGE FROM COPIER 100 TO CCU 200

MESSAGE CODE	NO. OF JAMS			NO. OF S/D ERRORS			NO. OF COPIES			STATE OF COPIER		
	TOTAL	PART A	PART B ...	TOTAL	TYPE A	TYPE B ...	TOTAL	SIZE A	SIZE B ...	STATE A	STATE B	STATE C ...

FIG.12B

MESSAGE FROM CCU 200 TO CSS 300

MODEL NO.	SERIAL NO.	MESSAGE	NO. OF S/D ERRORS			STATE OF COPIER			TIME OF OCCURRENCE
		CODE	TOTAL	TYPE A	TYPE B	...	STATE A	STATE B	

FIG.12C

RESPONSE FROM CCU 200 TO COPIER 100

RESPONSE CODE	CONTENTS OF RESPONSE
------------------	-------------------------

FIG.13A

READ REQUEST FROM CSS 300 TO CCU 200

MODEL NO.	SERIAL NO.	READ REQUEST CODE	ITEM CODE
-----------	------------	-------------------	-----------

READ REQUEST FROM CCU 200 TO COPIER 100

READ REQUEST CODE	ITEM CODE
-------------------	-----------

RESPONSE FROM CCU 200 TO CSS 300

MODEL NO.	SERIAL NO.	READ RESPONSE CODE	ITEM CODE	READ DATA
-----------	------------	--------------------	-----------	-----------

RESPONSE FROM COPIER 100 TO CCU 200

READ RESPONSE CODE	ITEM CODE	READ DATA
--------------------	-----------	-----------

FIG.13B

WRITE REQUEST FROM CSS 300 TO CCU 200

MODEL NO.	SERIAL NO.	WRITE REQUEST CODE	ITEM CODE	WRITE DATA
-----------	------------	--------------------	-----------	------------

WRITE REQUEST FROM CCU 200 TO COPIER 100

WRITE REQUEST CODE	ITEM CODE	WRITE DATA
--------------------	-----------	------------

RESPONSE FROM CCU 200 TO CSS 300

MODEL NO.	SERIAL NO.	WRITE RESPONSE CODE	ITEM CODE	WRITTEN DATA
-----------	------------	---------------------	-----------	--------------

RESPONSE FROM COPIER 100 TO CCU 200

WRITE RESPONSE CODE	ITEM CODE	WRITTEN DATA
---------------------	-----------	--------------

FIG.13C

EXECUTE REQUEST FROM CSS 300 TO CCU 200

MODEL NO.	SERIAL NO.	EXECUTE REQUEST CODE	ITEM CODE	SUBSIDIARY PARAMETER
-----------	------------	----------------------	-----------	----------------------

EXECUTE REQUEST FROM CCU 200 TO COPIER 100

EXECUTE REQUEST CODE	ITEM CODE	SUBSIDIARY PARAMETER
----------------------	-----------	----------------------

RESPONSE FROM CCU 200 TO CSS 300

MODEL NO.	SERIAL NO.	EXECUTE RESPONSE CODE	ITEM CODE	EXECUTION RESULT
-----------	------------	-----------------------	-----------	------------------

RESPONSE FROM COPIER 100 TO CCU 200

EXECUTE RESPONSE CODE	ITEM CODE	EXECUTION RESULT
-----------------------	-----------	------------------

FIG.14A

READ REQUEST FROM CSS 300 TO CCU 200

CCU DEVICE CODE	READ REQUEST CODE	ITEM CODE
-----------------	-------------------	-----------

RESPONSE FROM CCU 200 TO CSS 300

CCU DEVICE CODE	READ RESPONSE CODE	ITEM CODE	READ DATA
-----------------	--------------------	-----------	-----------

FIG.14B

WRITE REQUEST FROM CSS 300 TO CCU 200

CCU DEVICE CODE	WRITE REQUEST CODE	ITEM CODE	WRITE DATA
-----------------	--------------------	-----------	------------

RESPONSE FROM CCU 200 TO CSS 300

CCU DEVICE CODE	WRITE RESPONSE CODE	ITEM CODE	WRITTEN DATA
-----------------	---------------------	-----------	--------------

FIG.14C

EXECUTE REQUEST FROM CSS 300 TO CCU 200

CCU DEVICE CODE	EXECUTE REQUEST CODE	ITEM CODE	SUBSIDIARY PARAMETER
-----------------	----------------------	-----------	----------------------

RESPONSE FROM CCU 200 TO CSS 300

CCU DEVICE CODE	EXECUTE RESPONSE CODE	ITEM CODE	EXECUTION RESULT
-----------------	-----------------------	-----------	------------------

FIG.15A

READ REQUEST FROM CCU 200 TO COPIER 100

READ REQUEST CODE	ITEM CODE
-------------------	-----------

FIG.15B

RESPONSE FROM COPIER 100 TO CCU 200

READ RESPONSE CODE	ITEM CODE	READ DATA
--------------------	-----------	-----------

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FIG.16

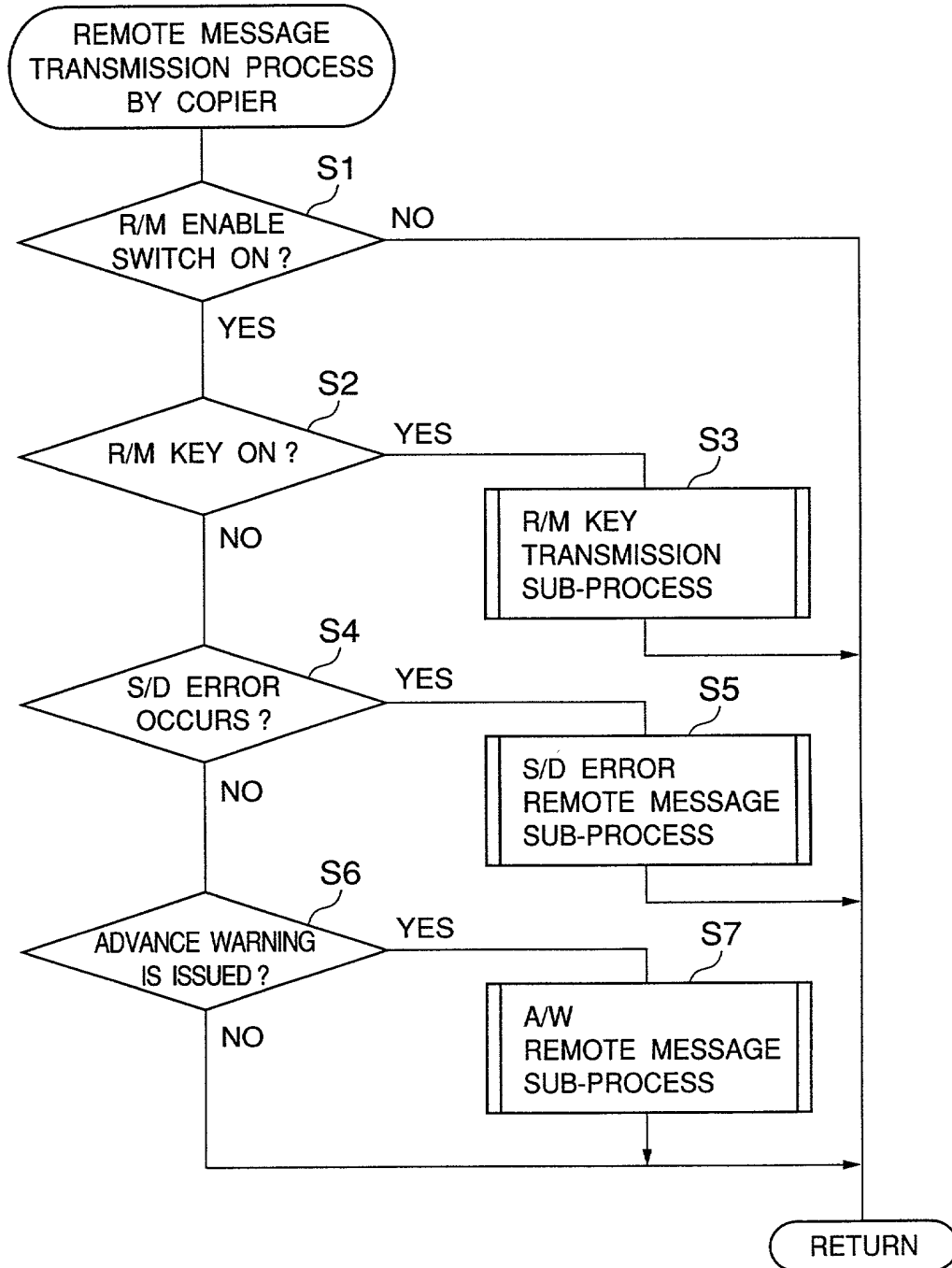


FIG.17

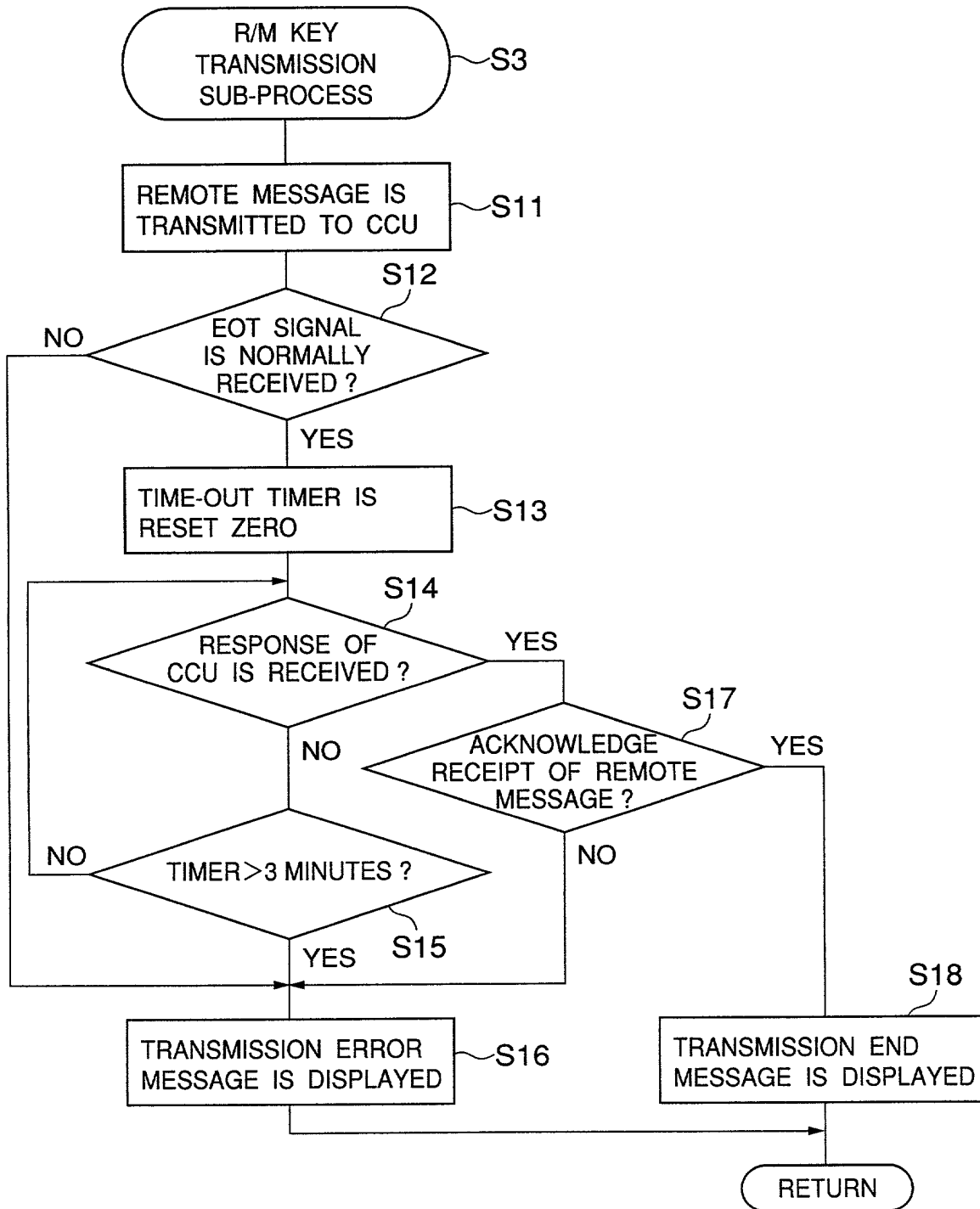


FIG.18

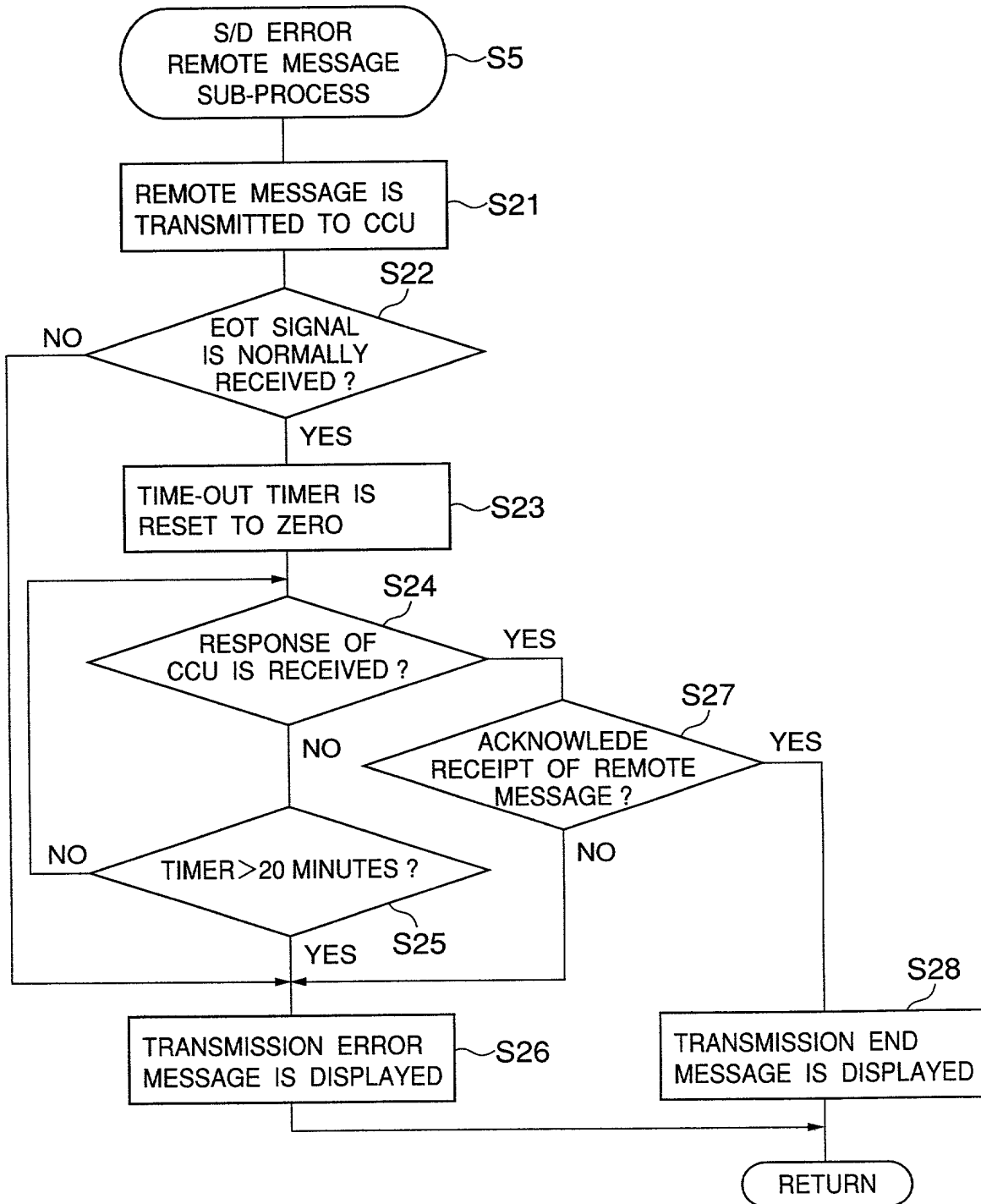


FIG.19

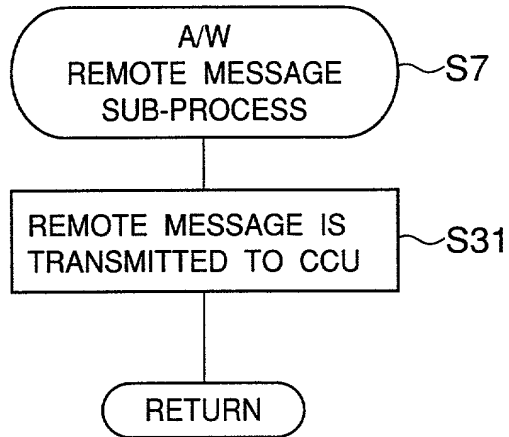


FIG.20

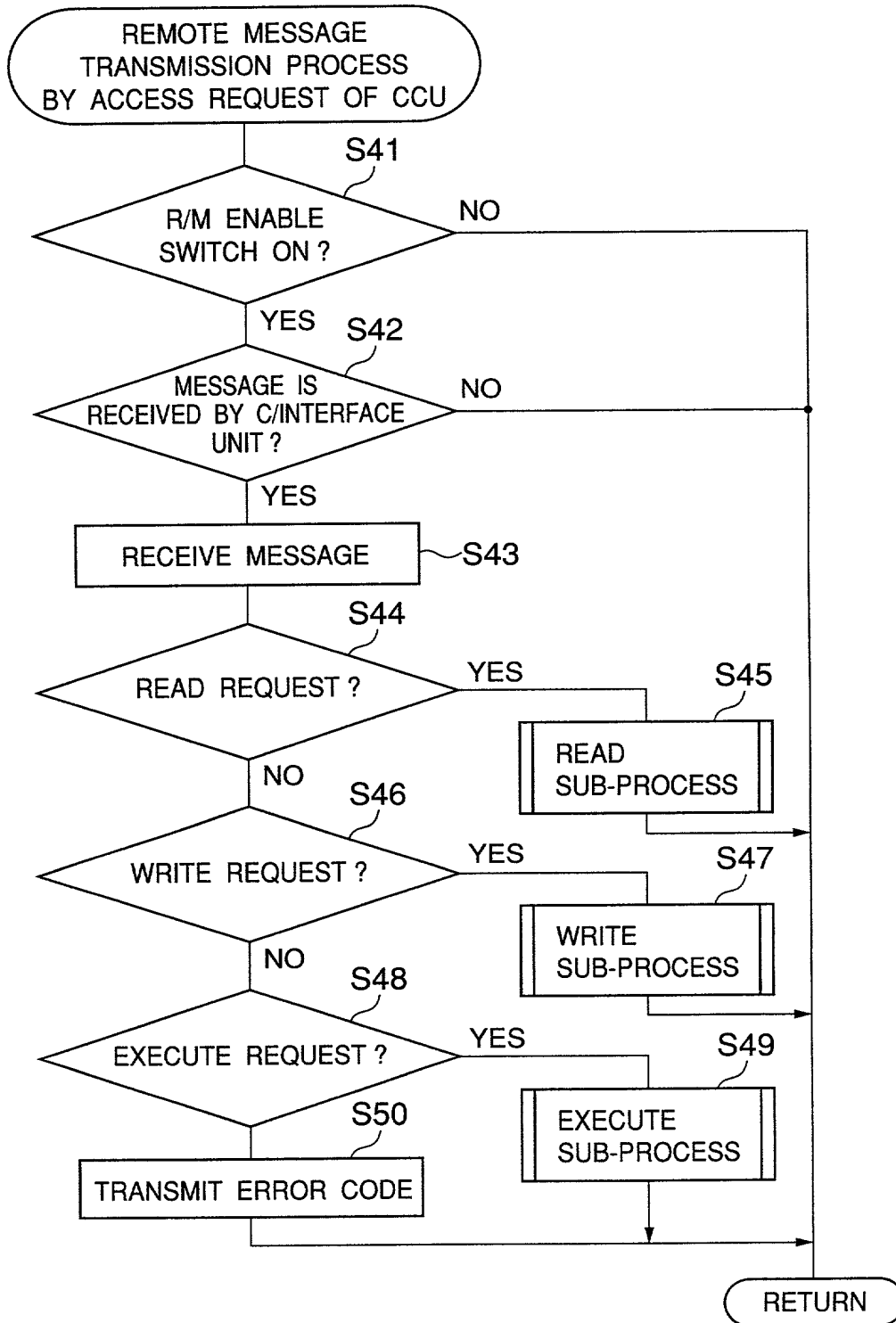


FIG.21

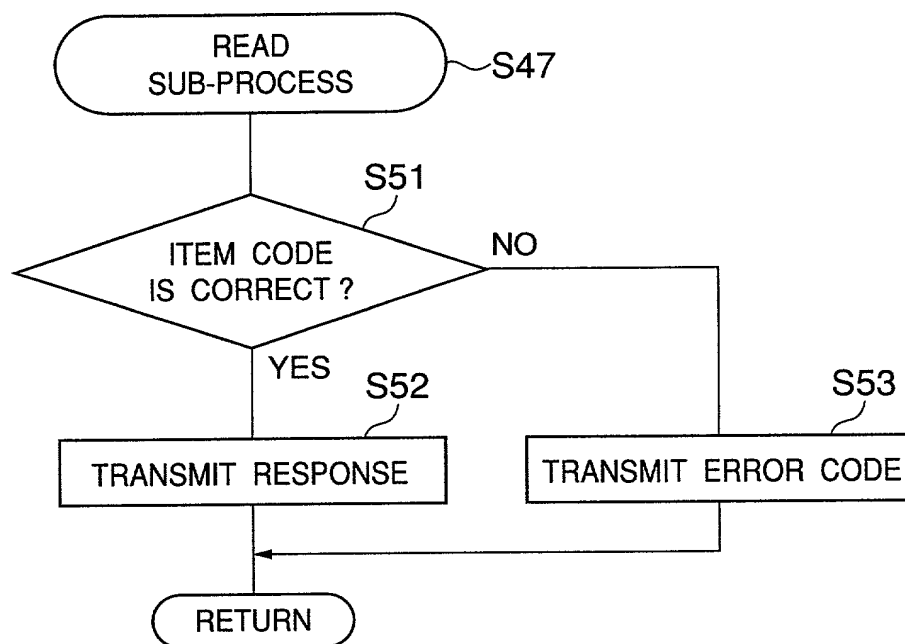


FIG.22

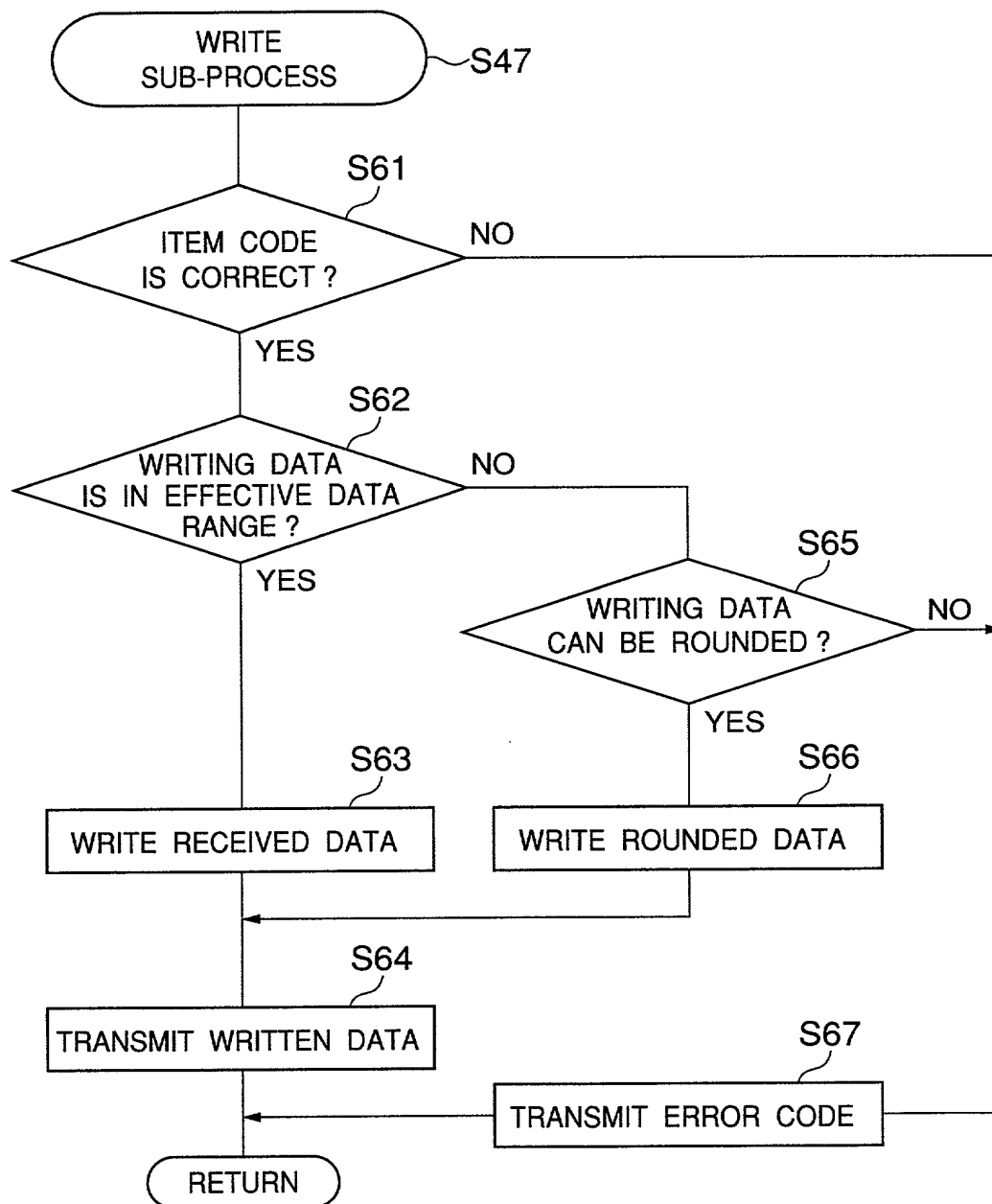


FIG.23

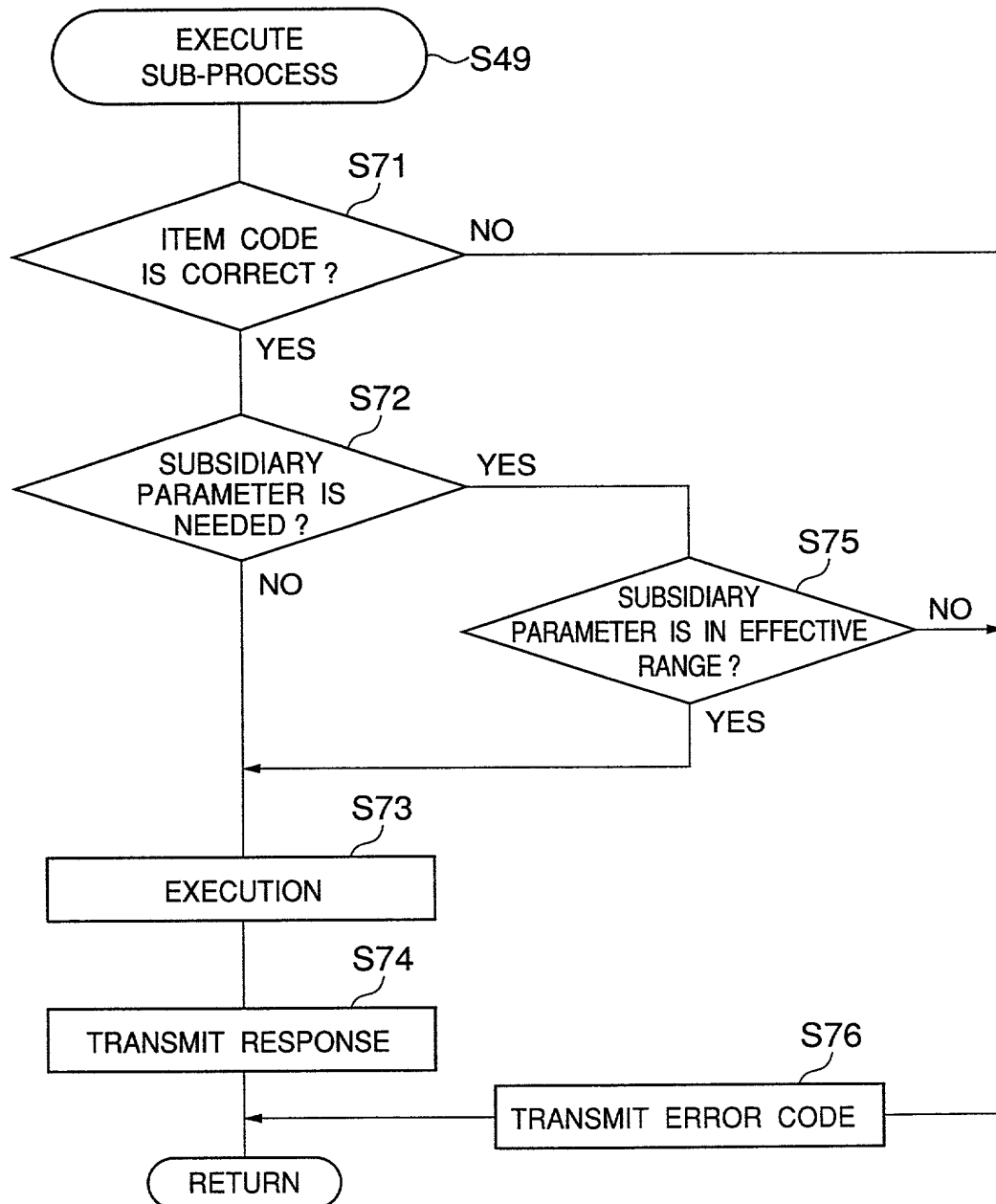


FIG.24

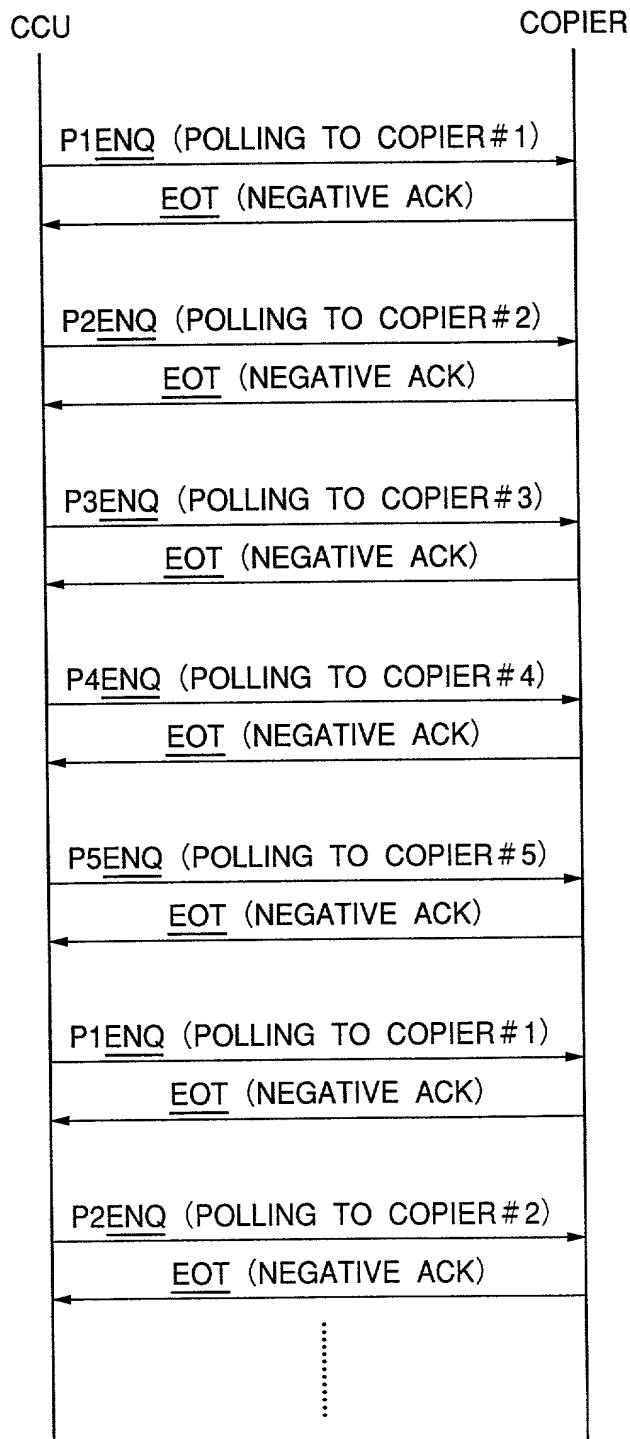


FIG.25

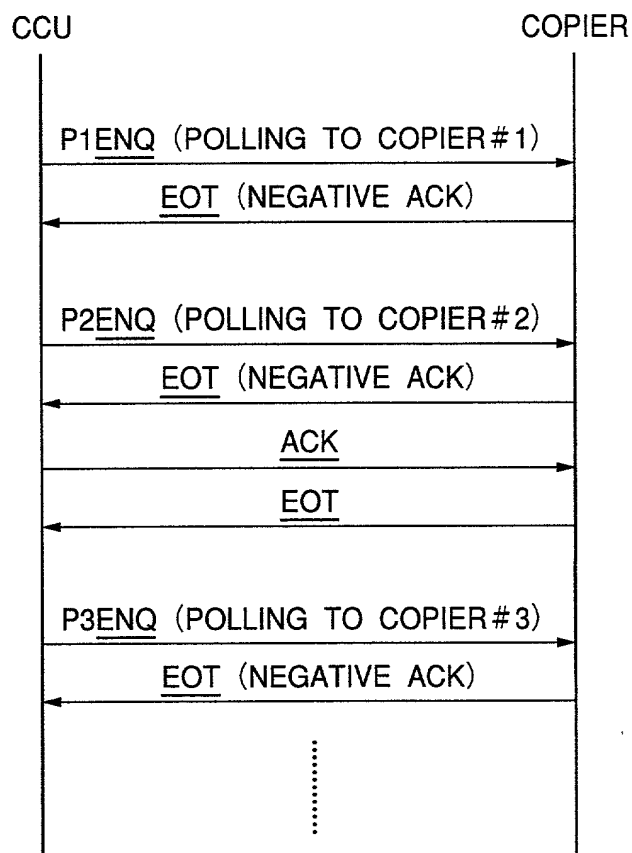


FIG.26

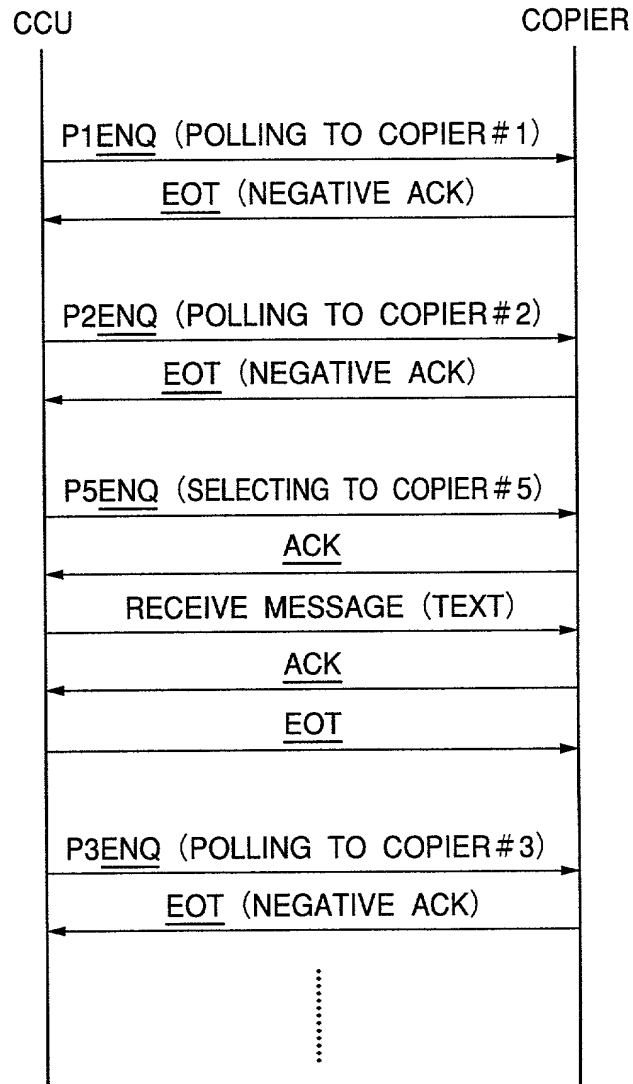


FIG.27

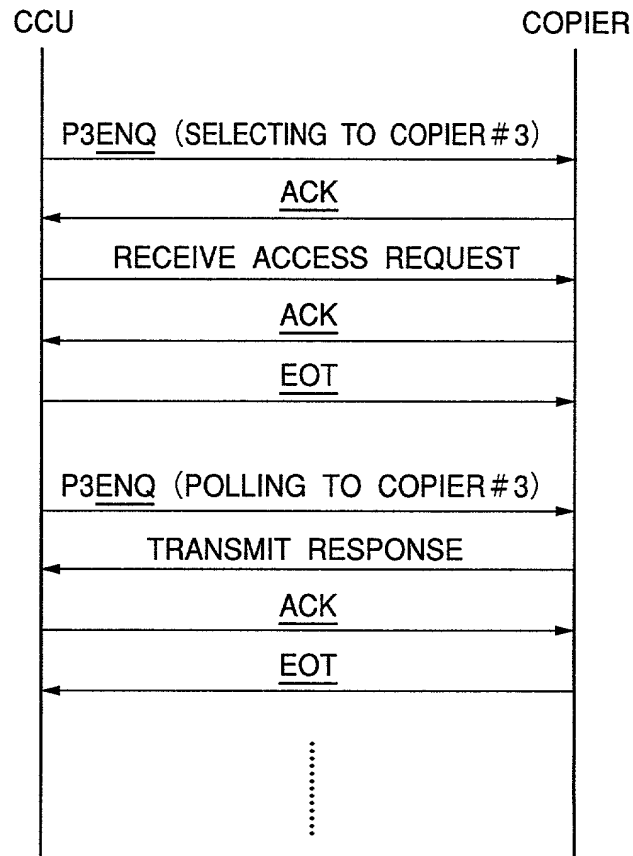


FIG.28

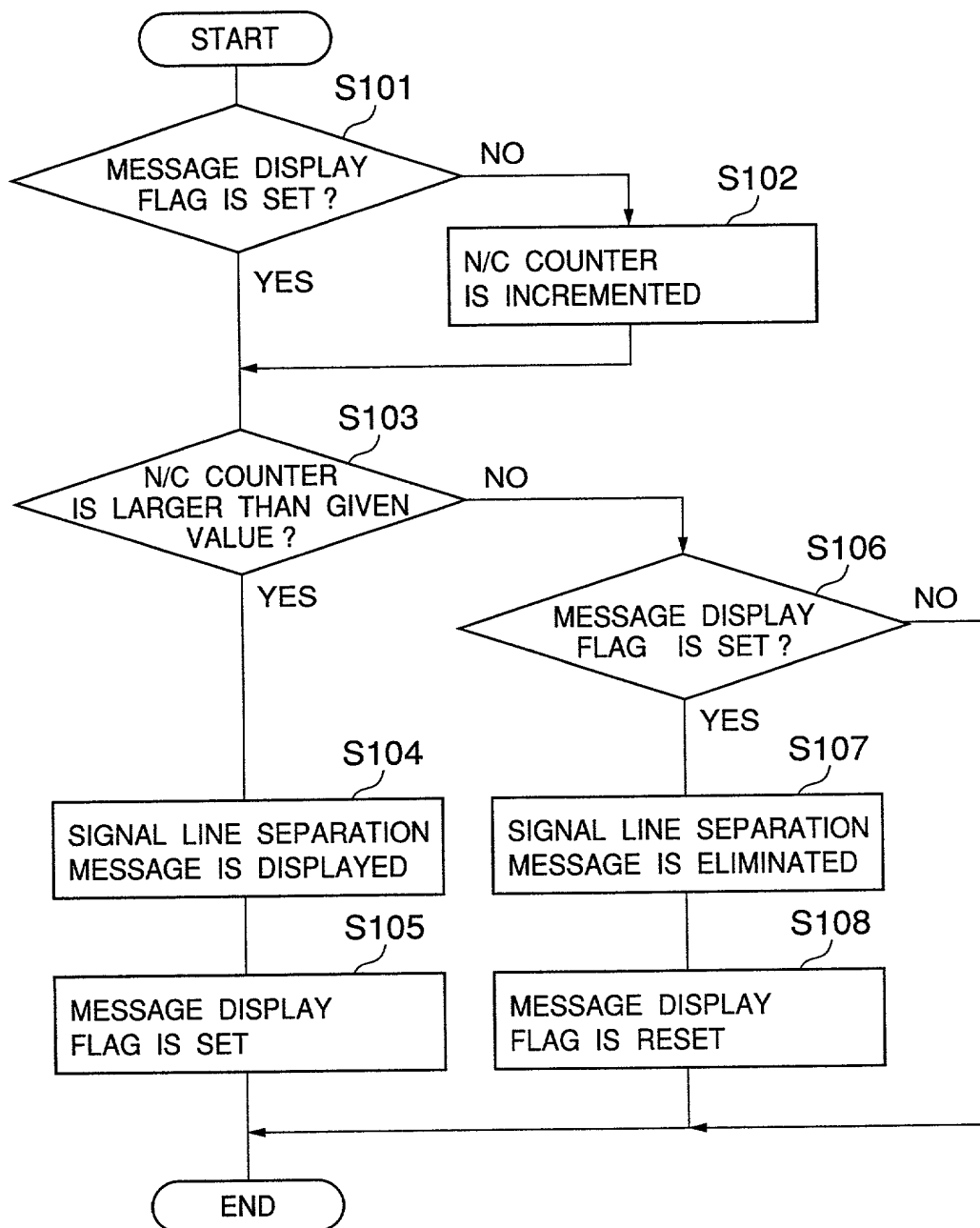
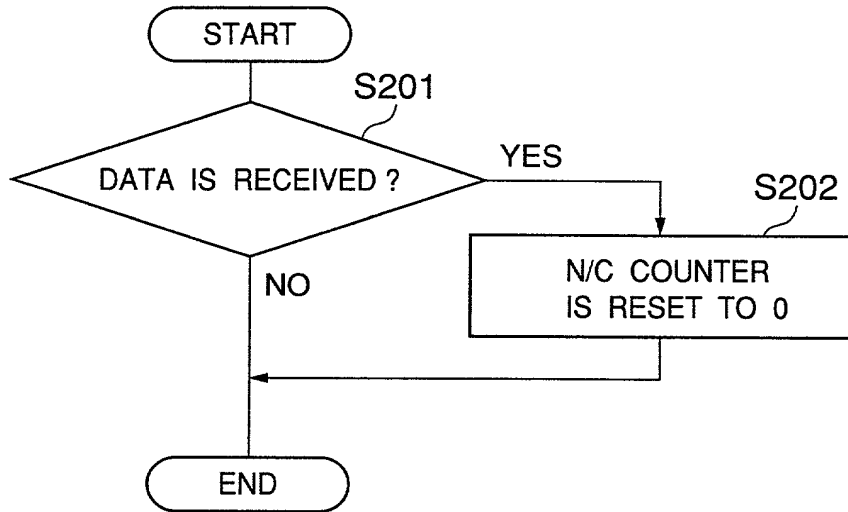
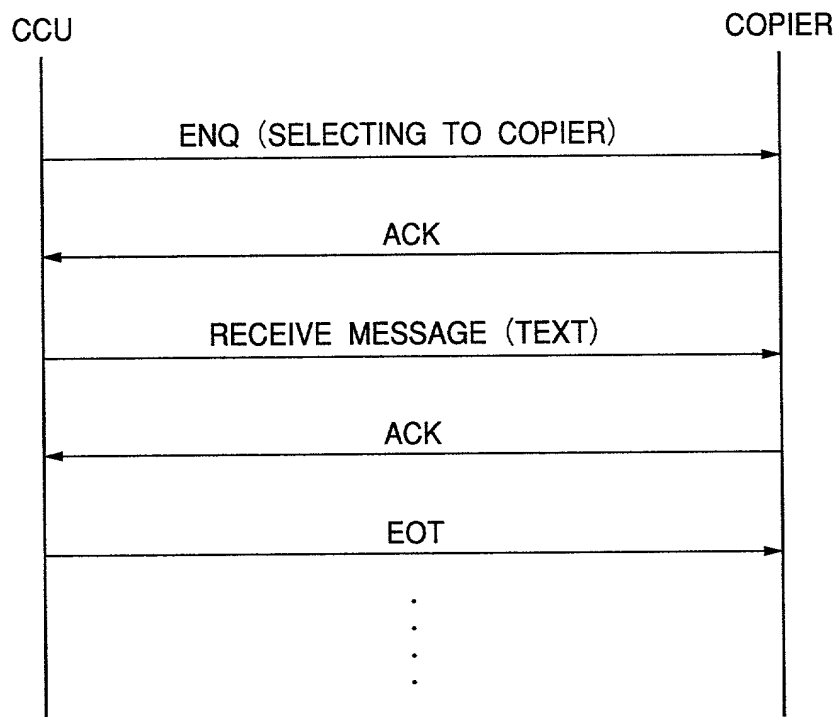


FIG.29



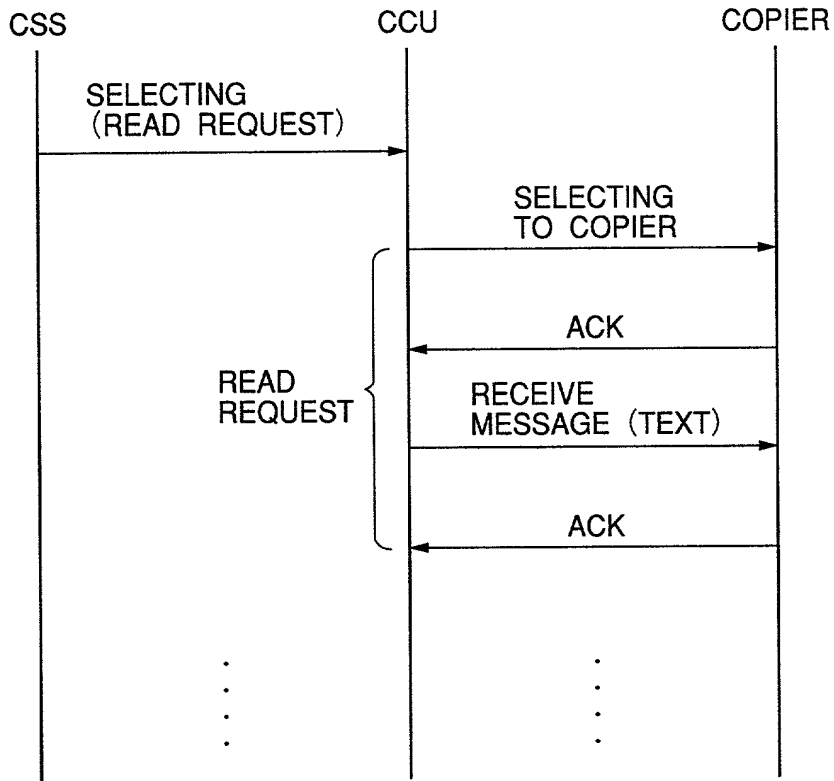
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FIG.30



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FIG.31



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FIG.32

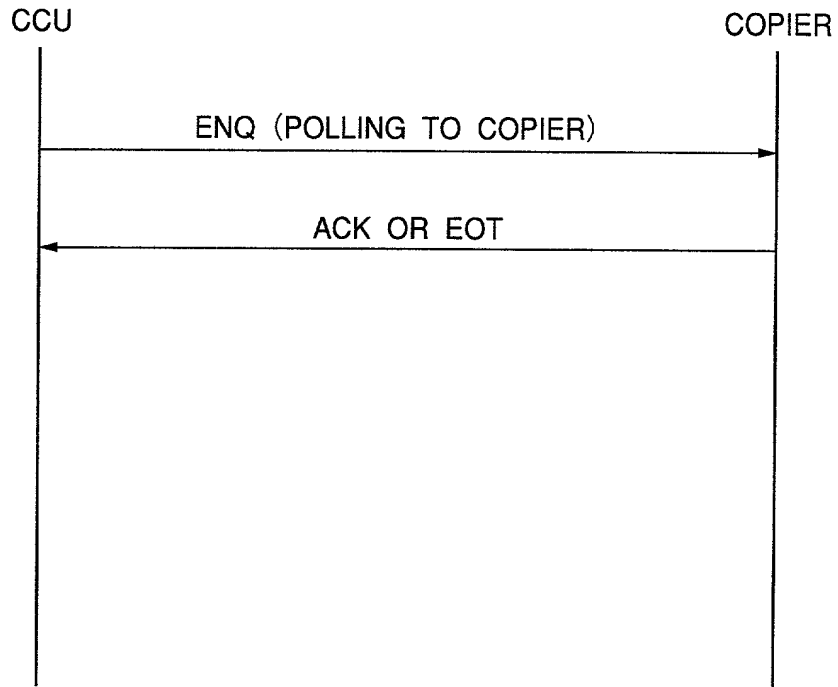


FIG.33

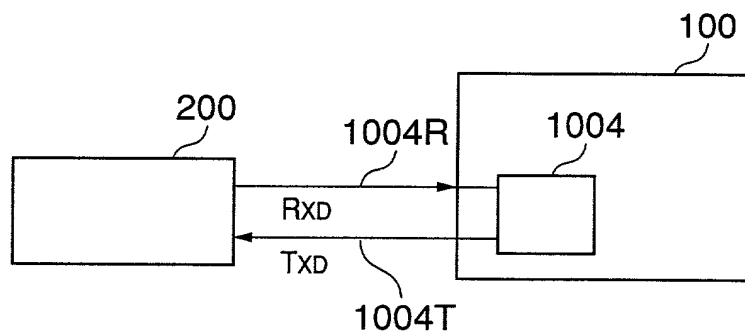


FIG.34

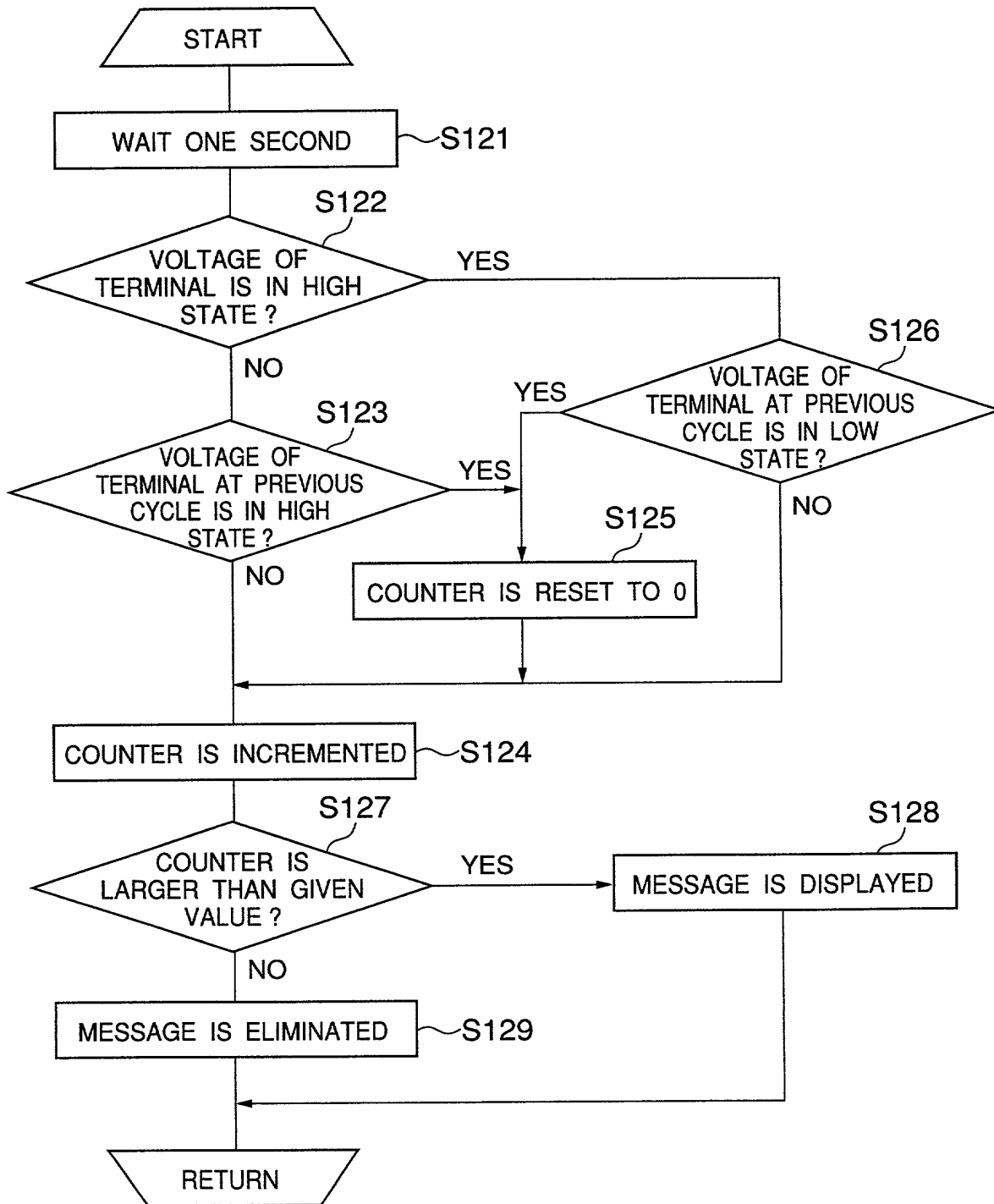


FIG.35A

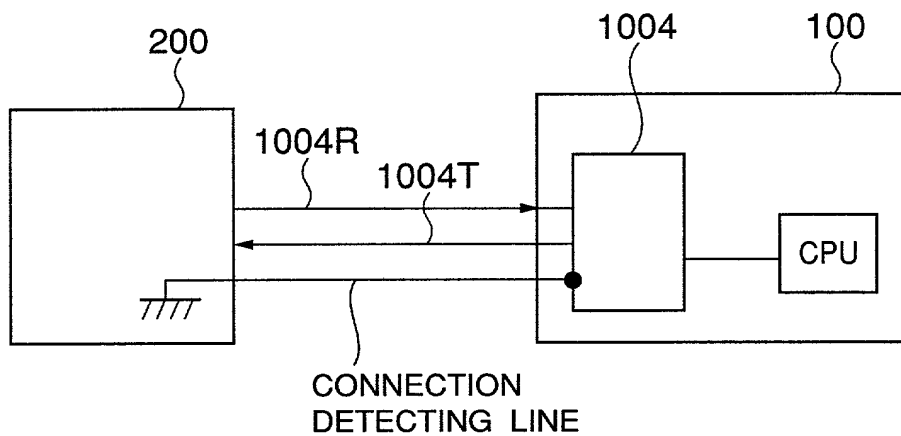


FIG.35B

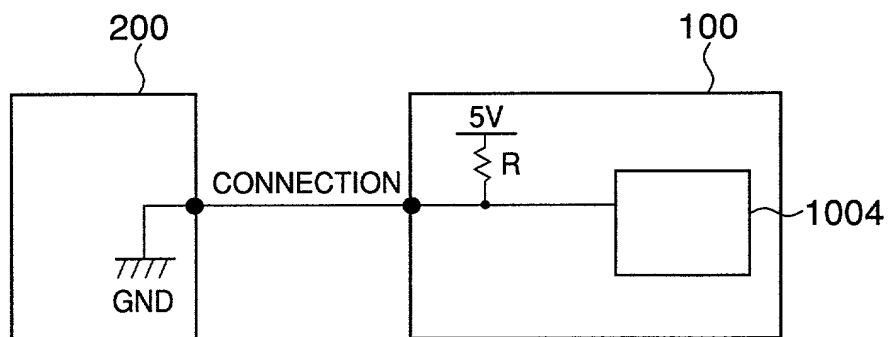


FIG.36

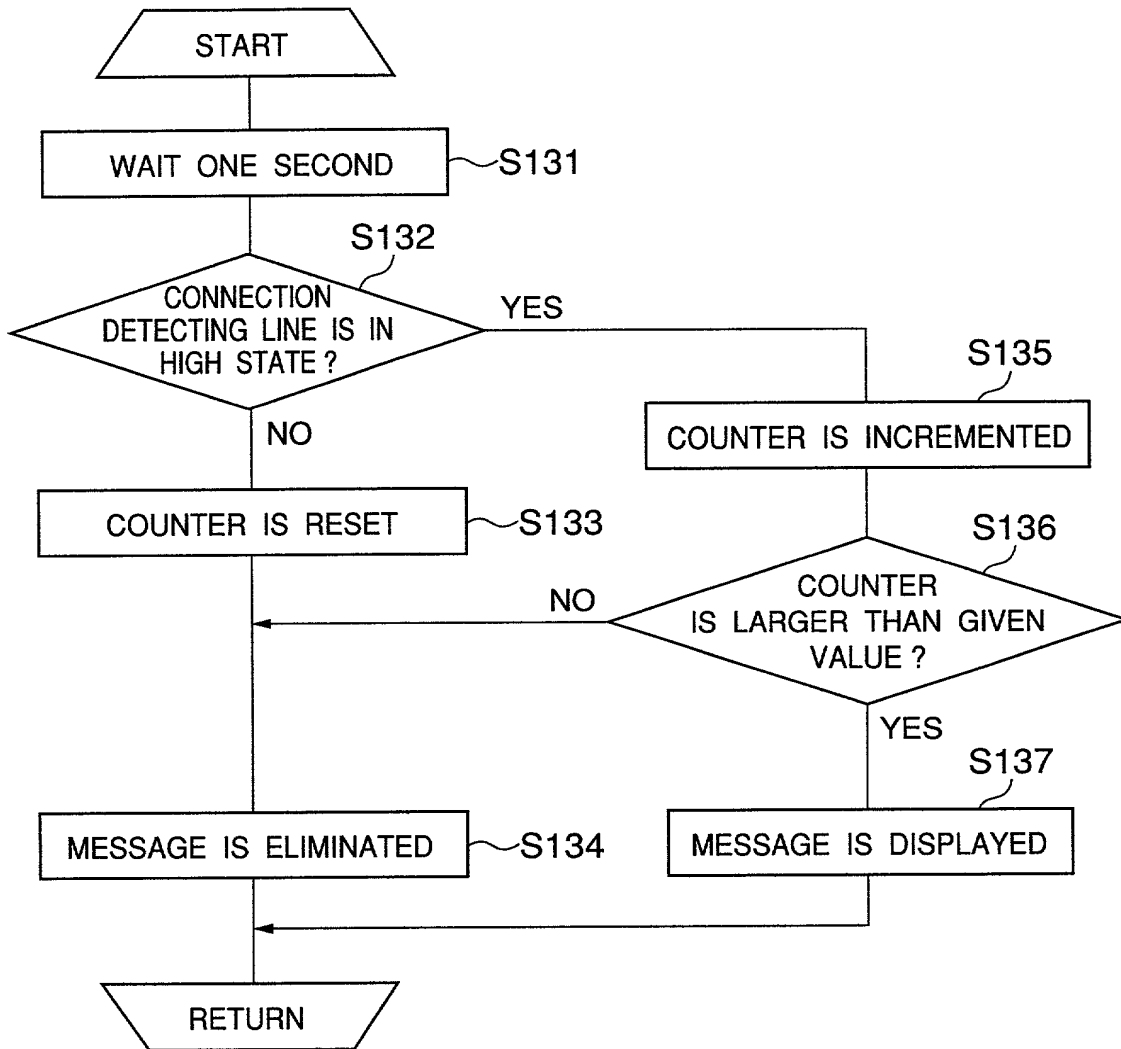


FIG.37

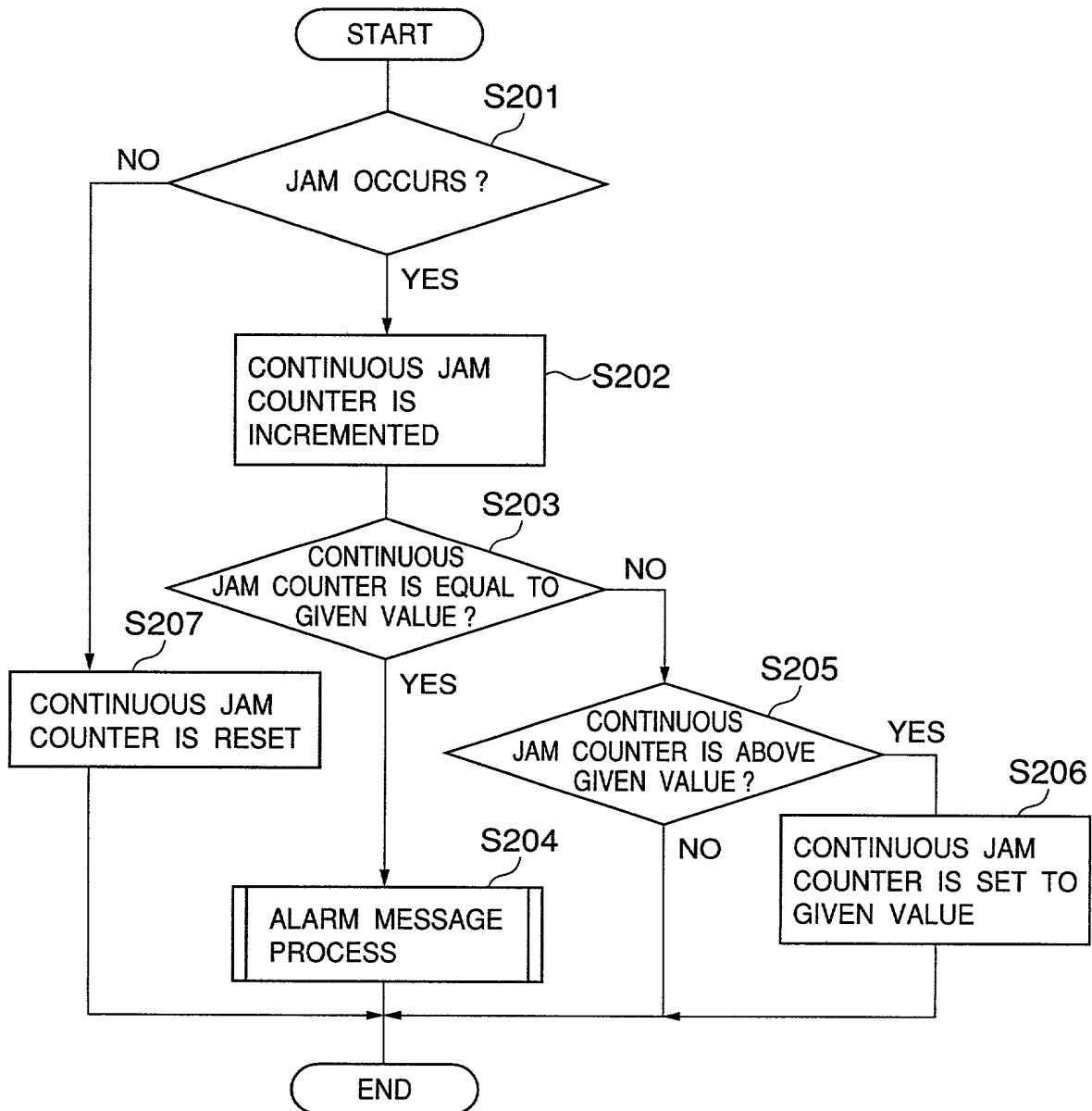


FIG.38

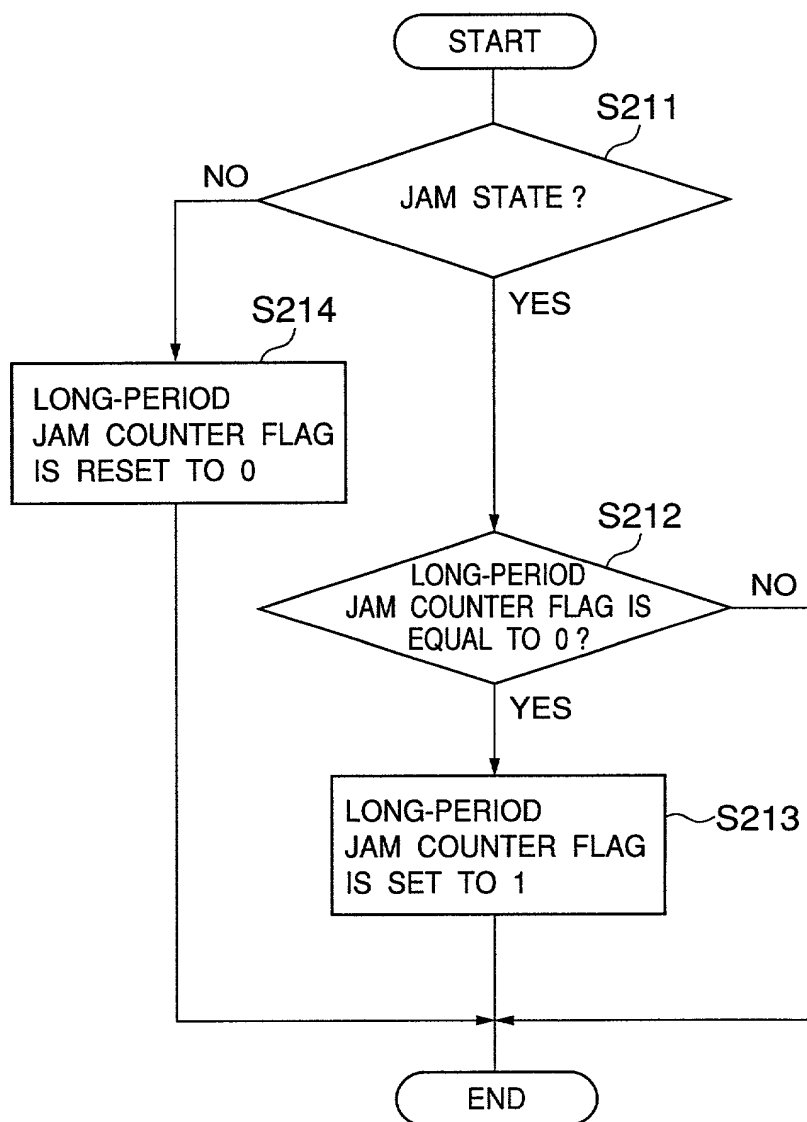


FIG.39

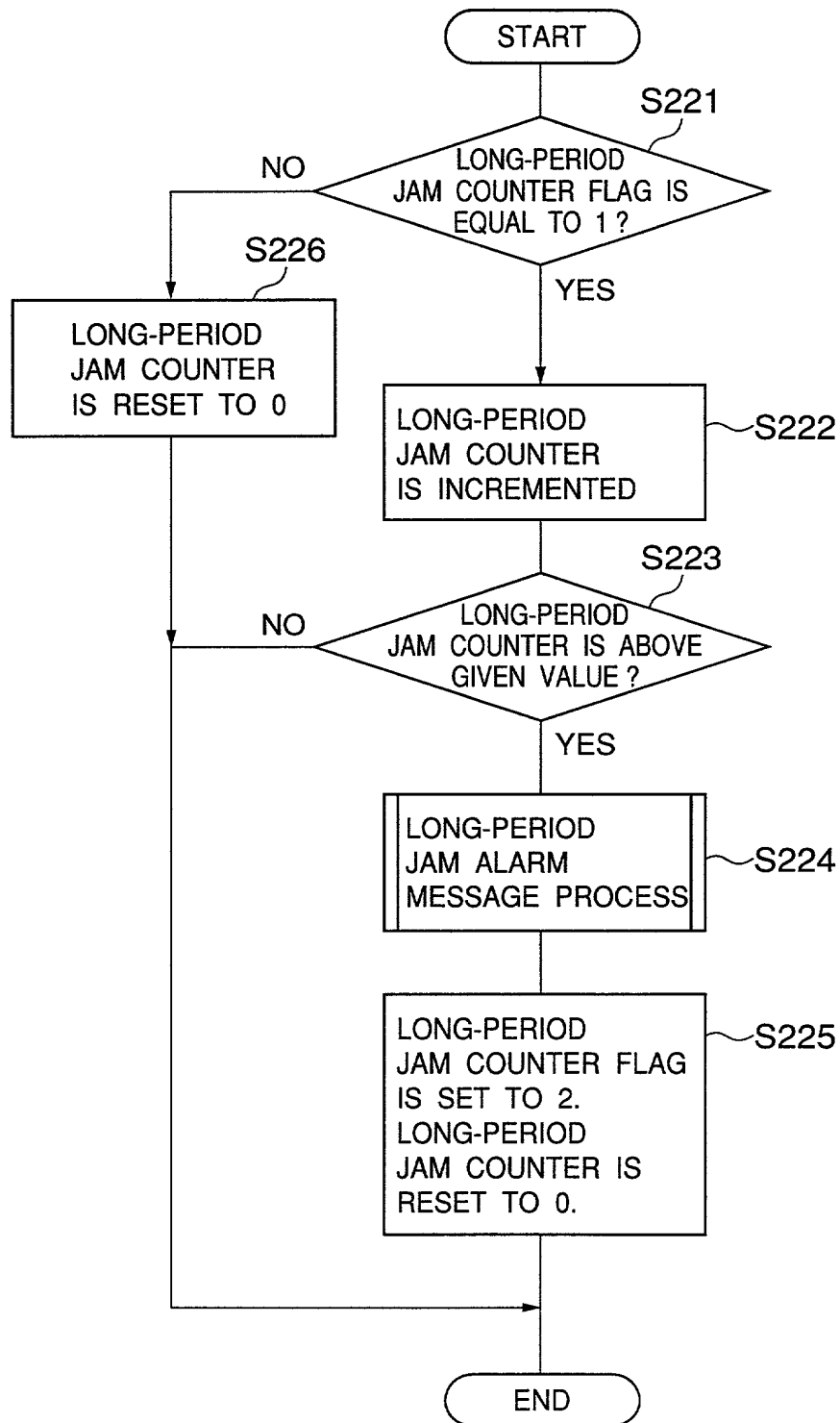


FIG.40

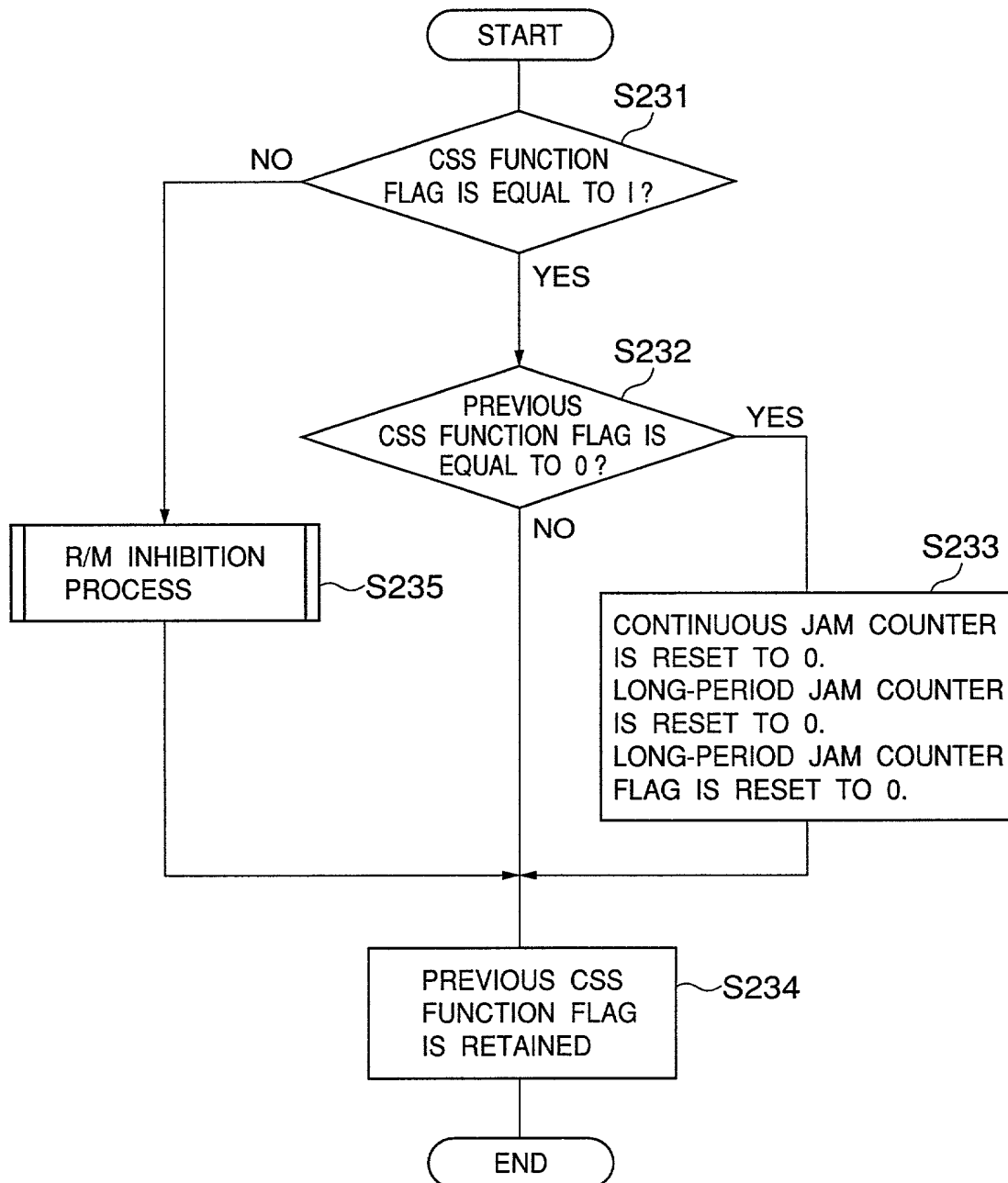


FIG.41

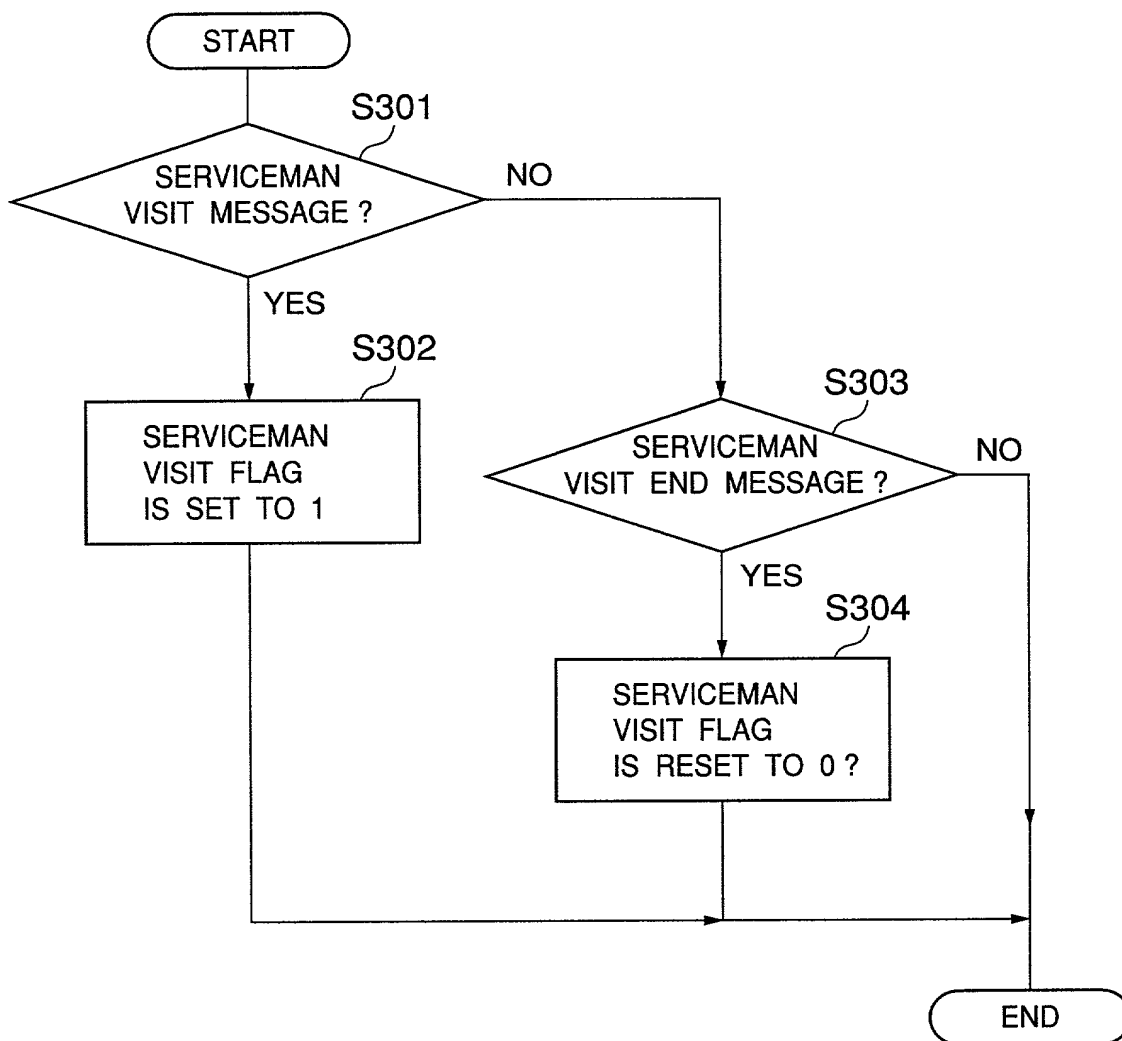


FIG.42

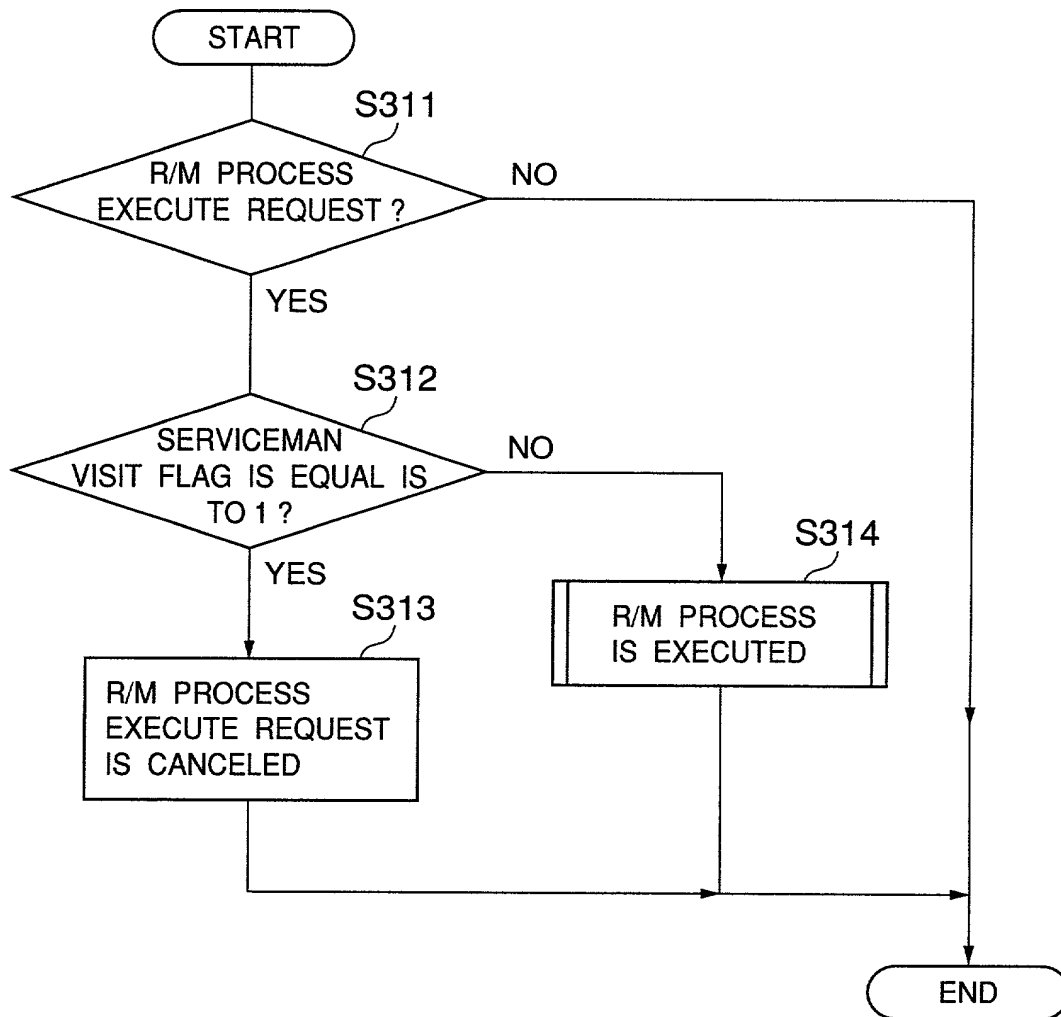


FIG.43

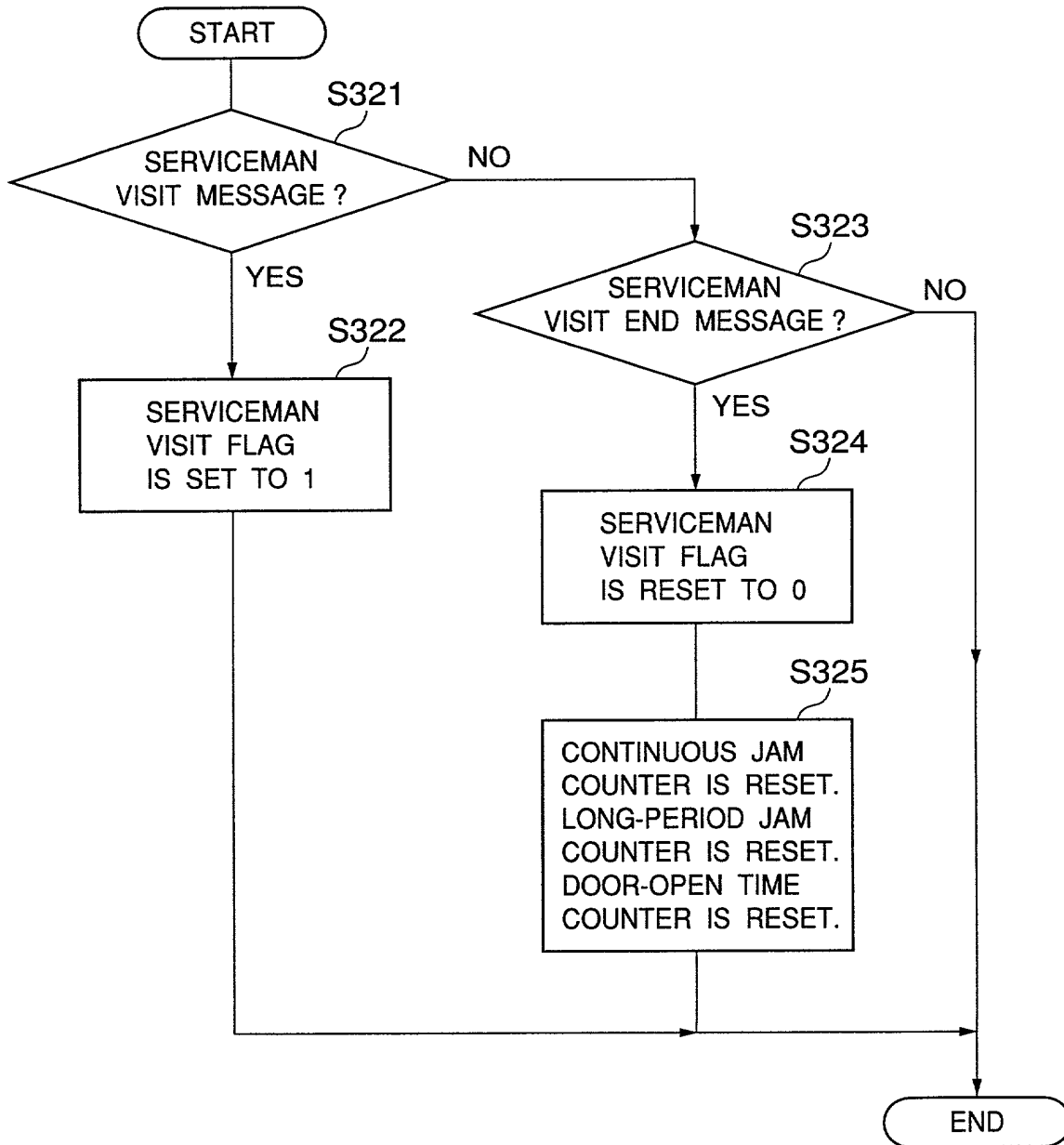


FIG. 44

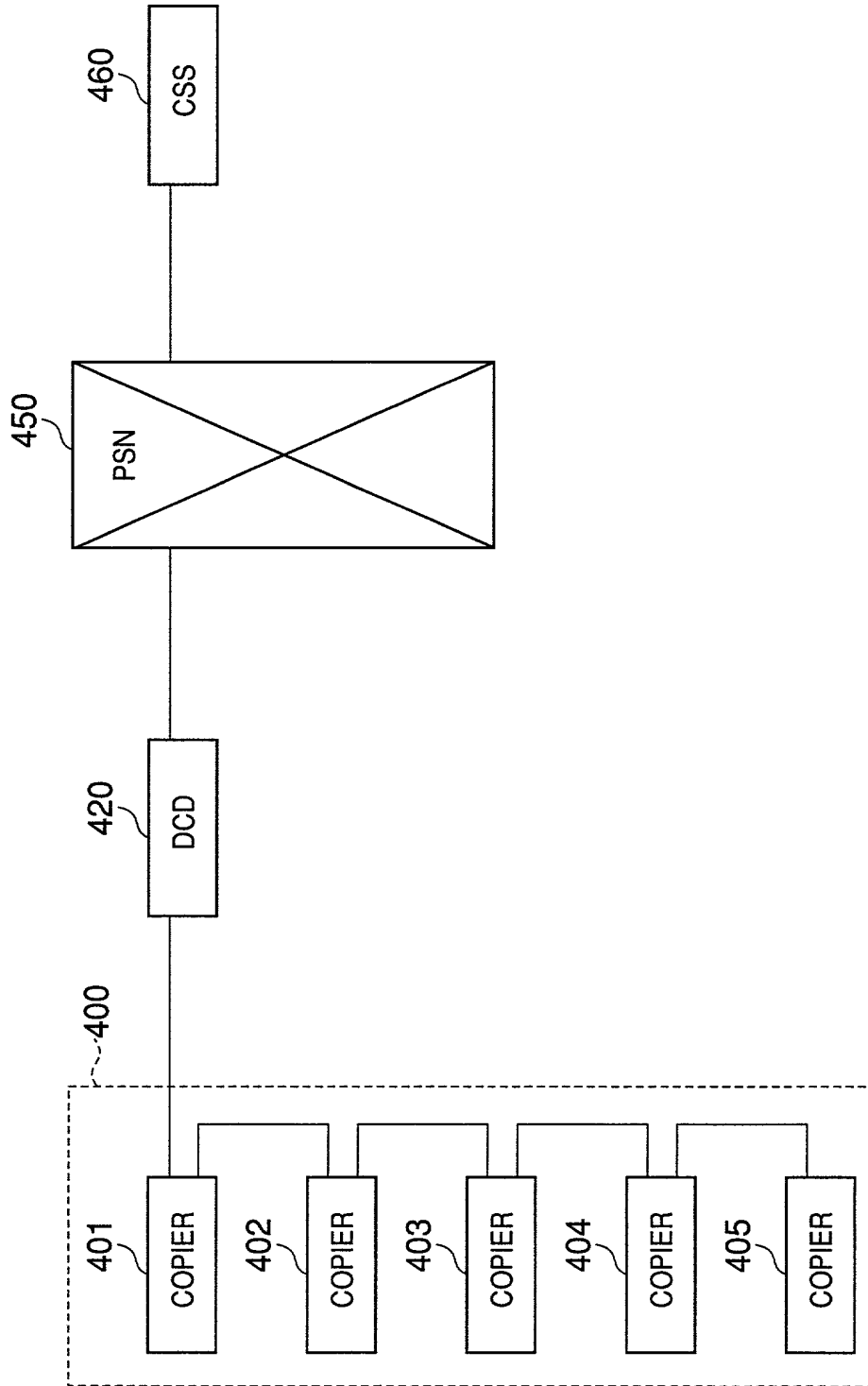


FIG.45

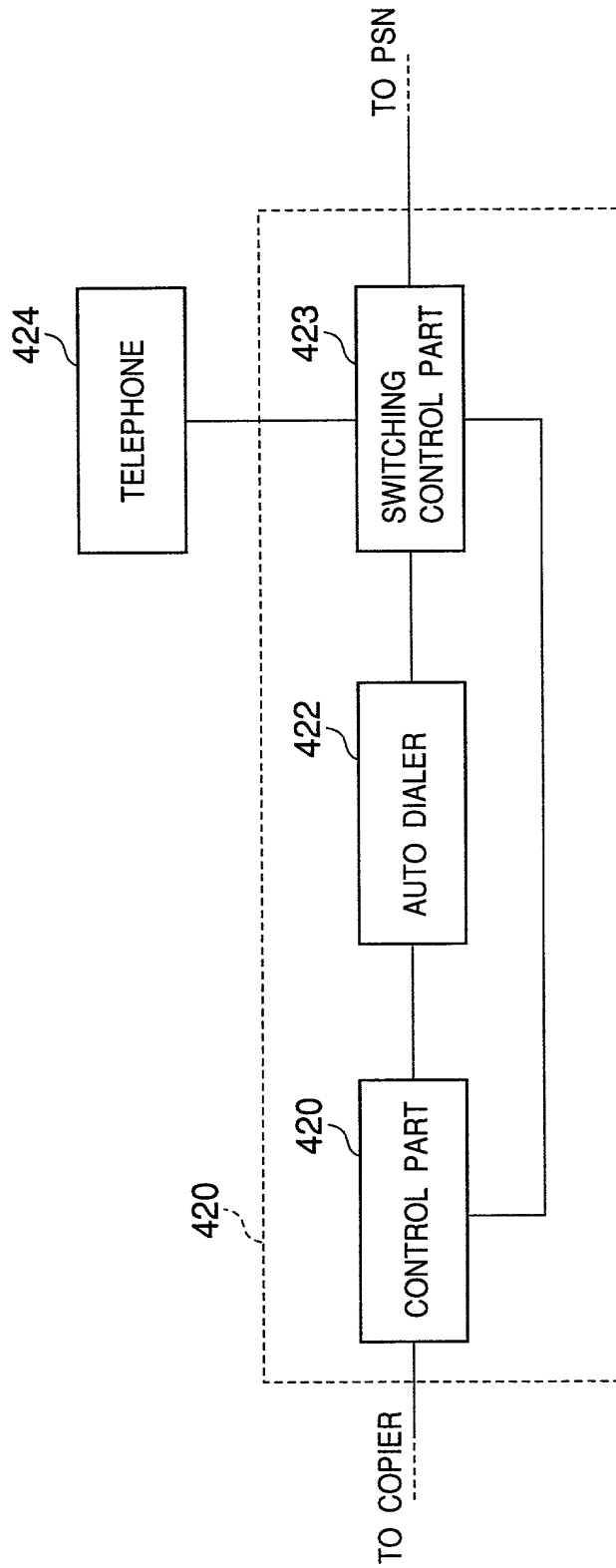


FIG.46

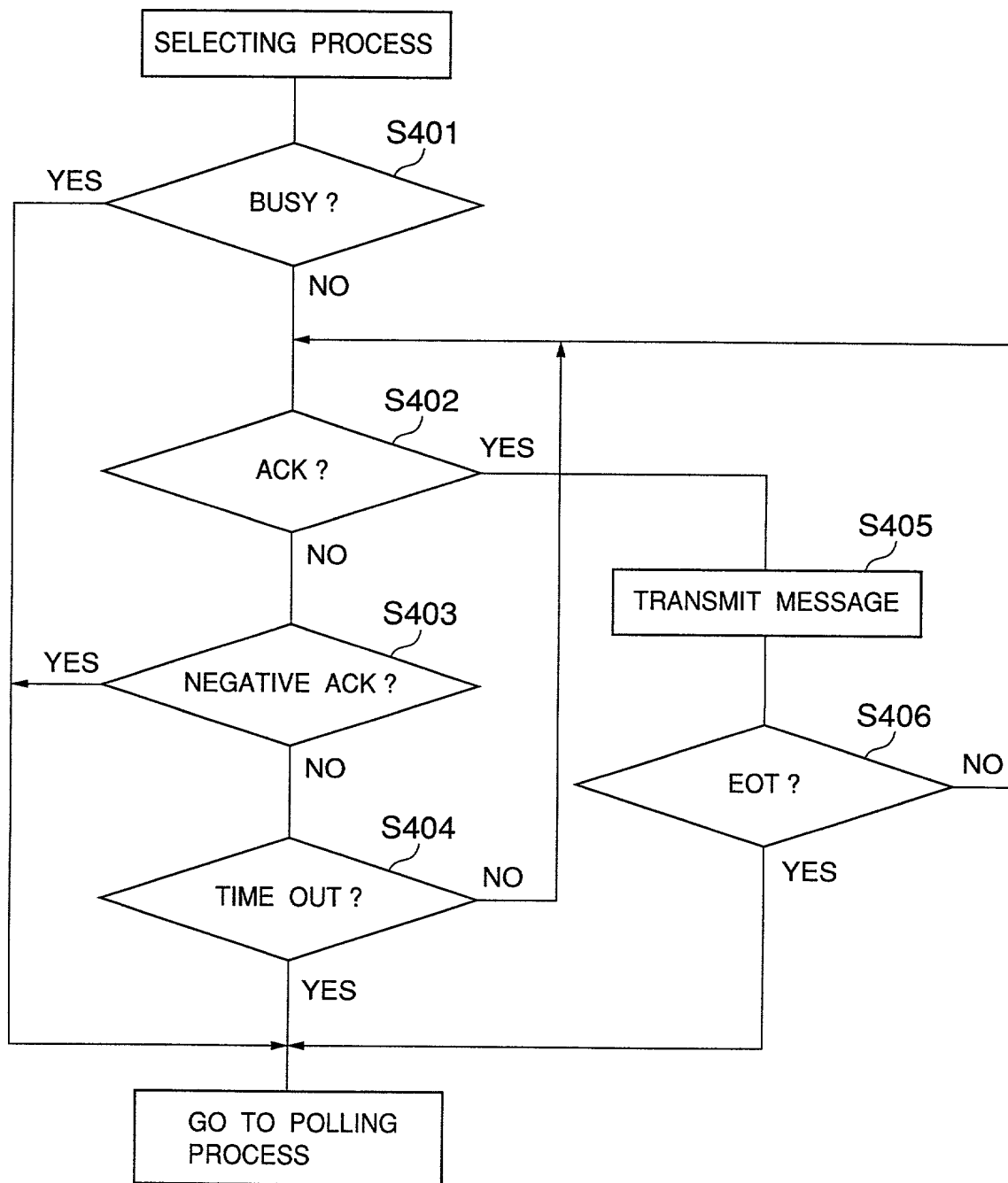
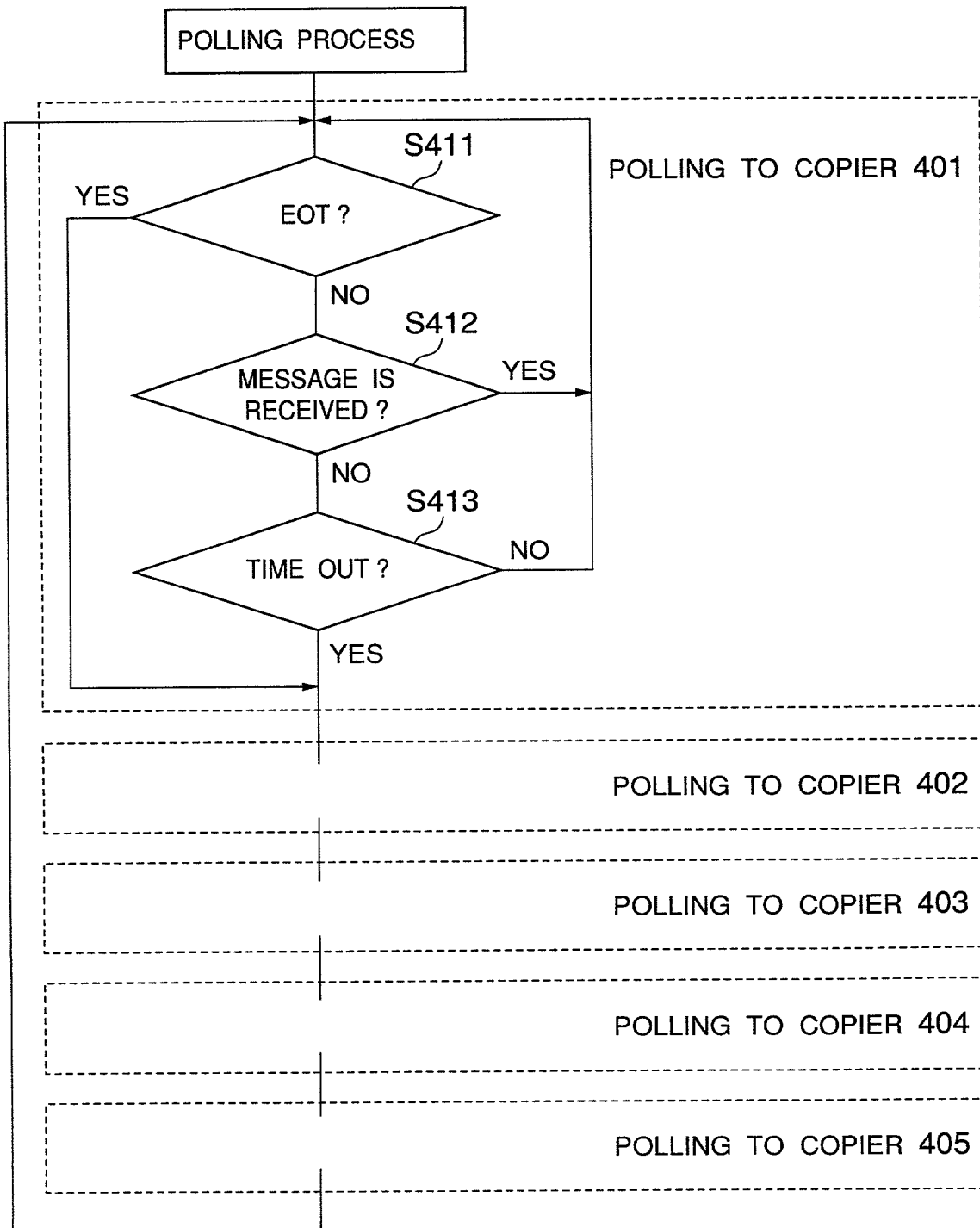


FIG.47



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FIG. 48

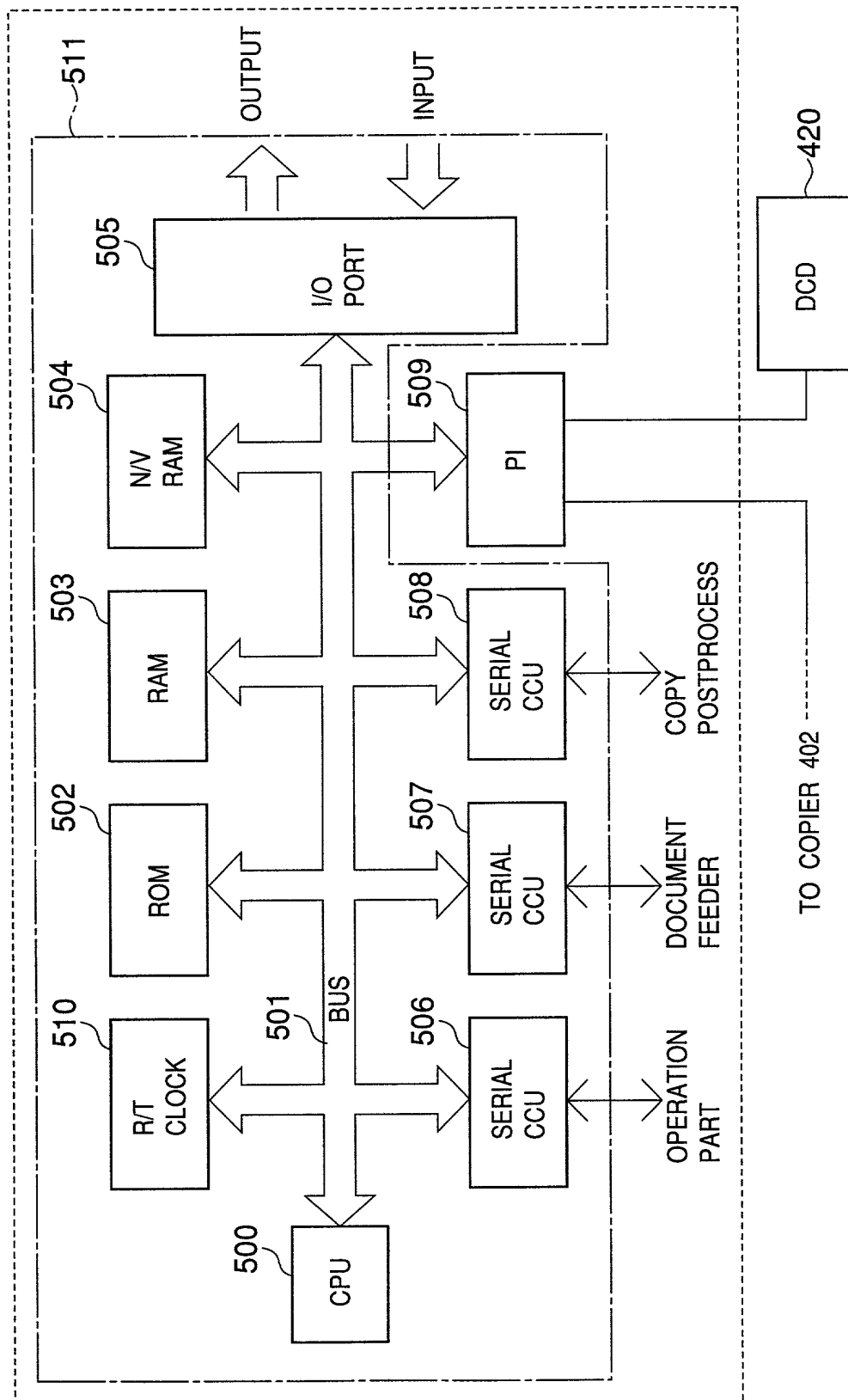


FIG.49

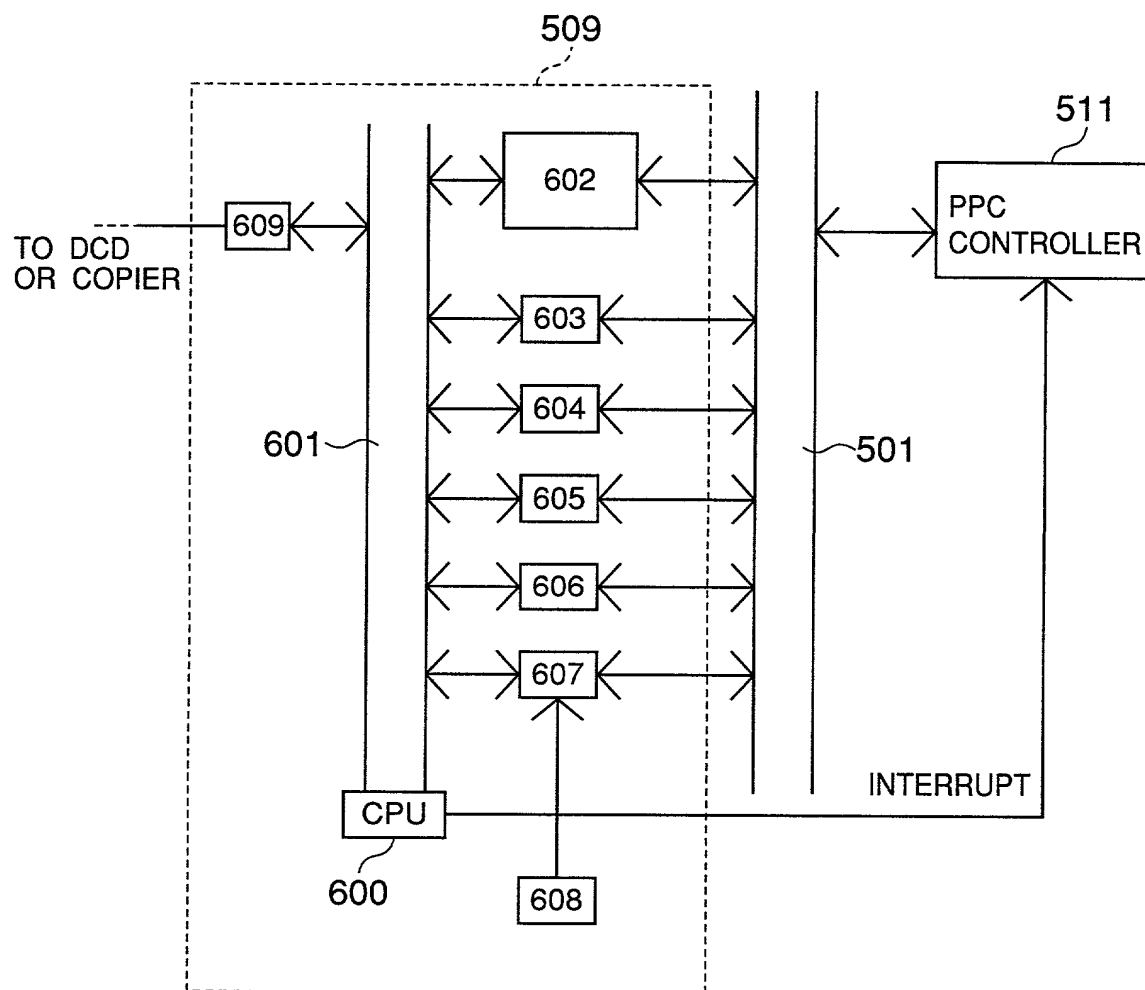


FIG.50

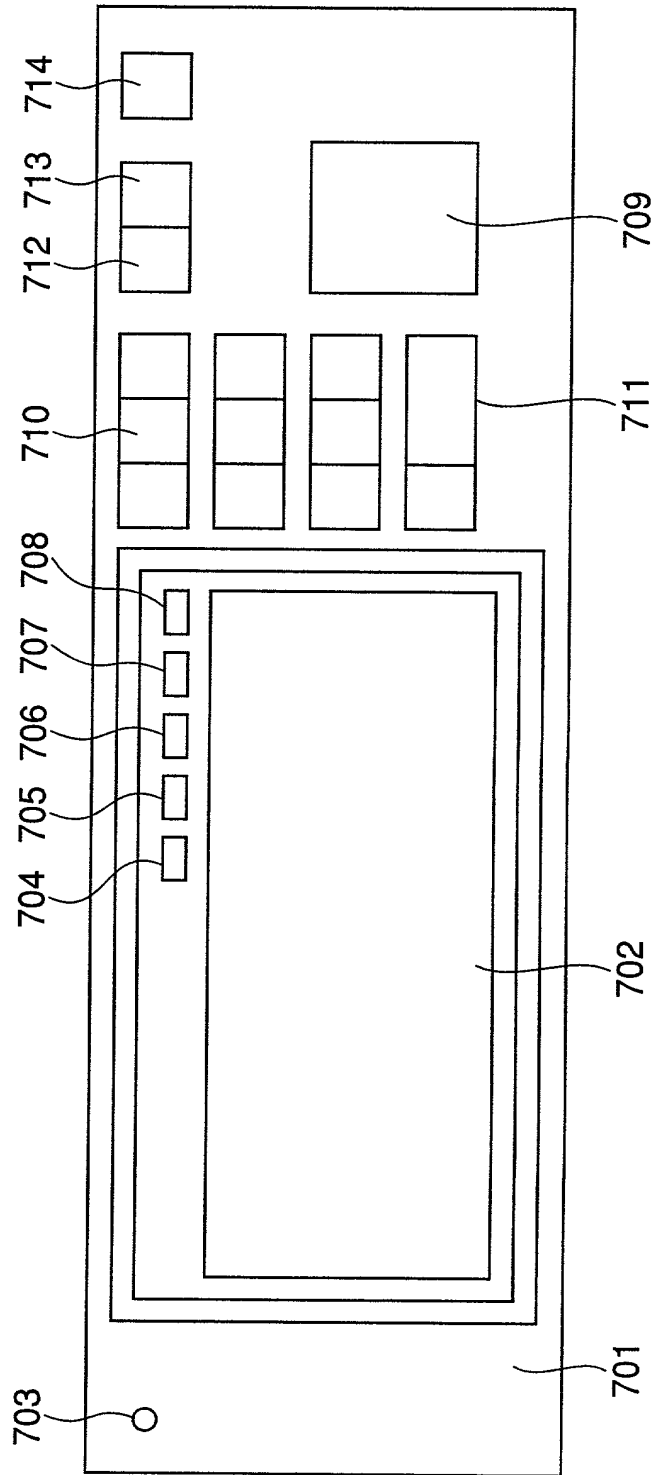


FIG.51

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SORTER	P/O	DUPLEX	SIZING			COPY POSSIBLE				1
			9 3 %			A 3	A 4	B 4	B 5	ASS
			A3 → A4	B4 → B5	8 7 %					
		S → D	B4 → B5	A4 → A5	8 2 %					
SORT	BACK	D → D	A3 → A4	B4 → B5	7 1 %					ADS
STACK	FRONT	D → S	R/D			LIGHT				
			E/L			DEEP				
			E/S							

FIG.52

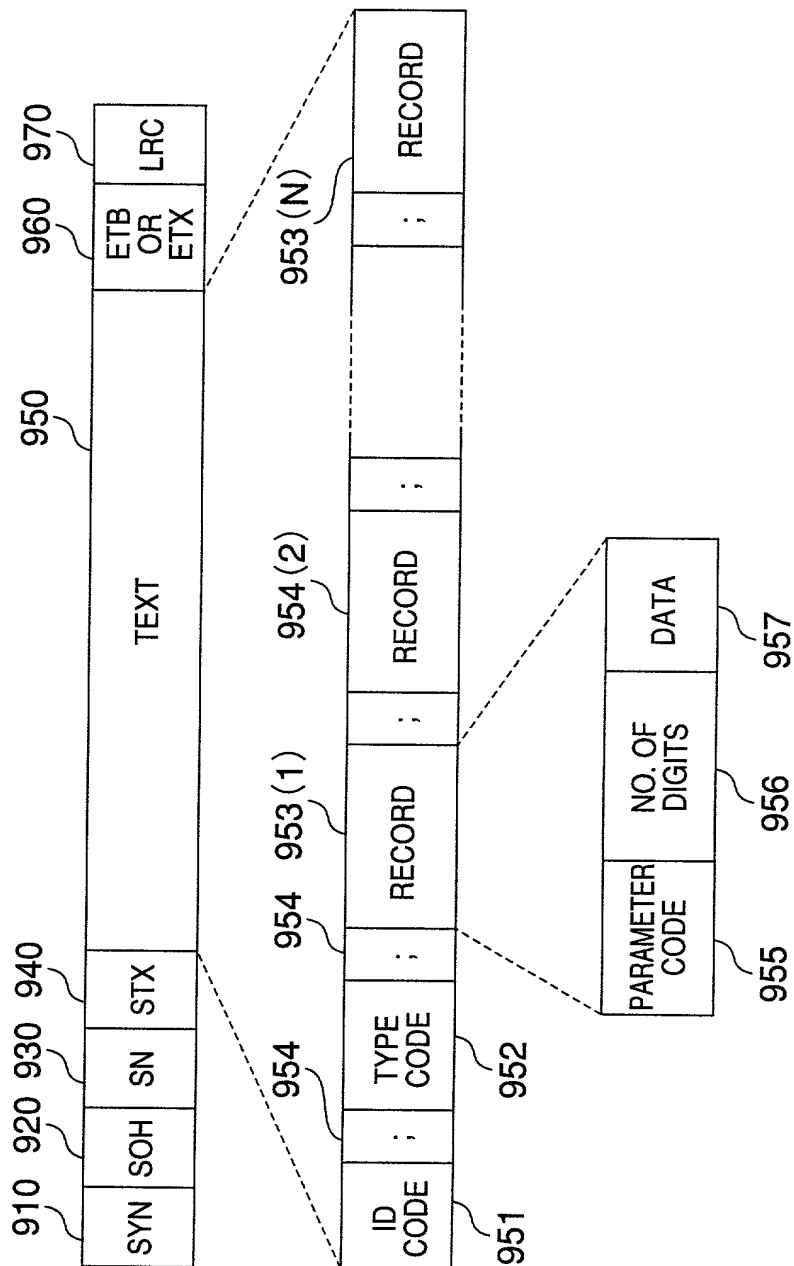


FIG.53

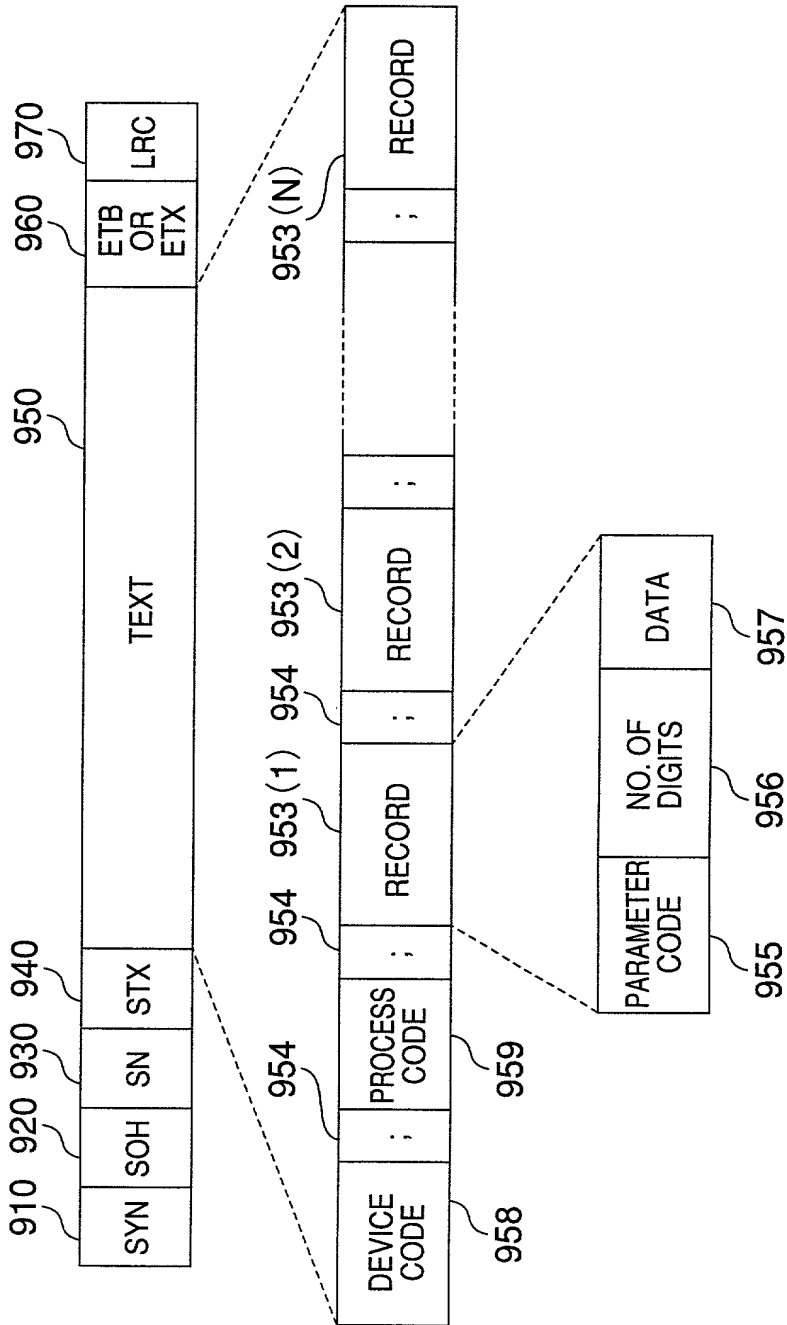


FIG.54

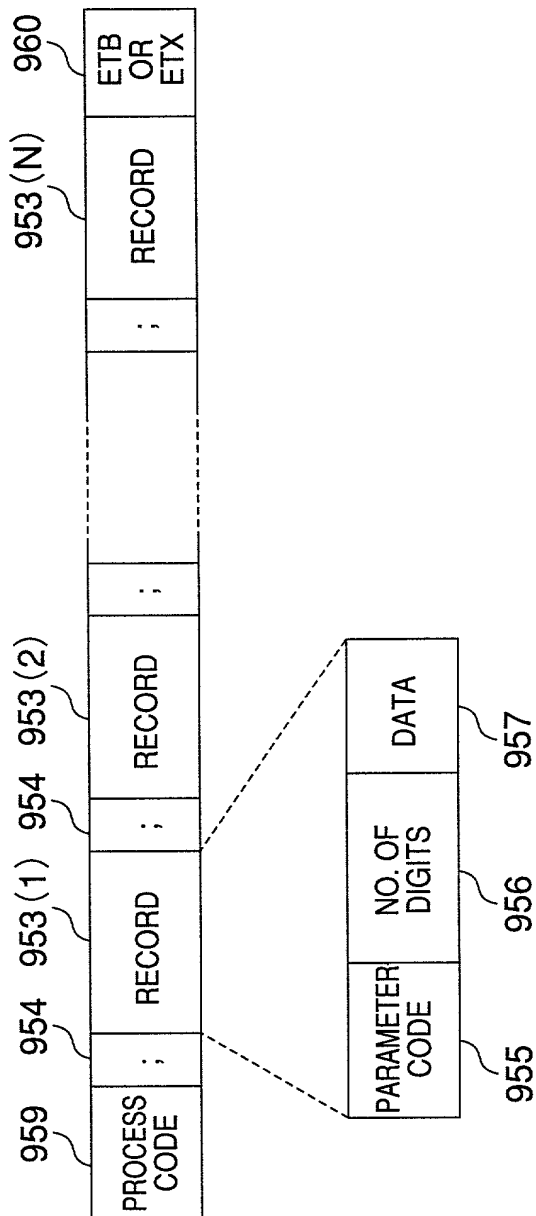


FIG.55

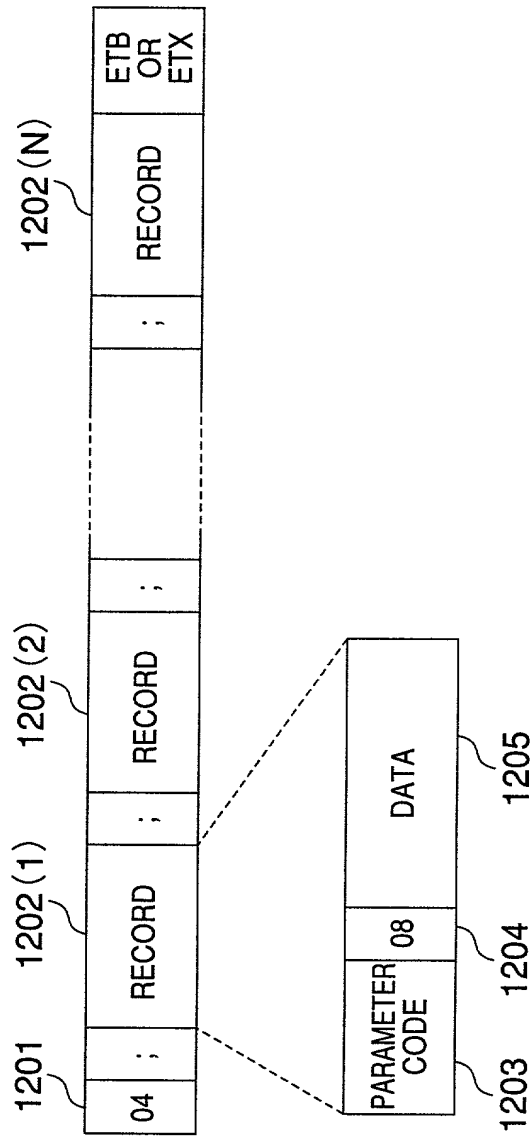


FIG.56

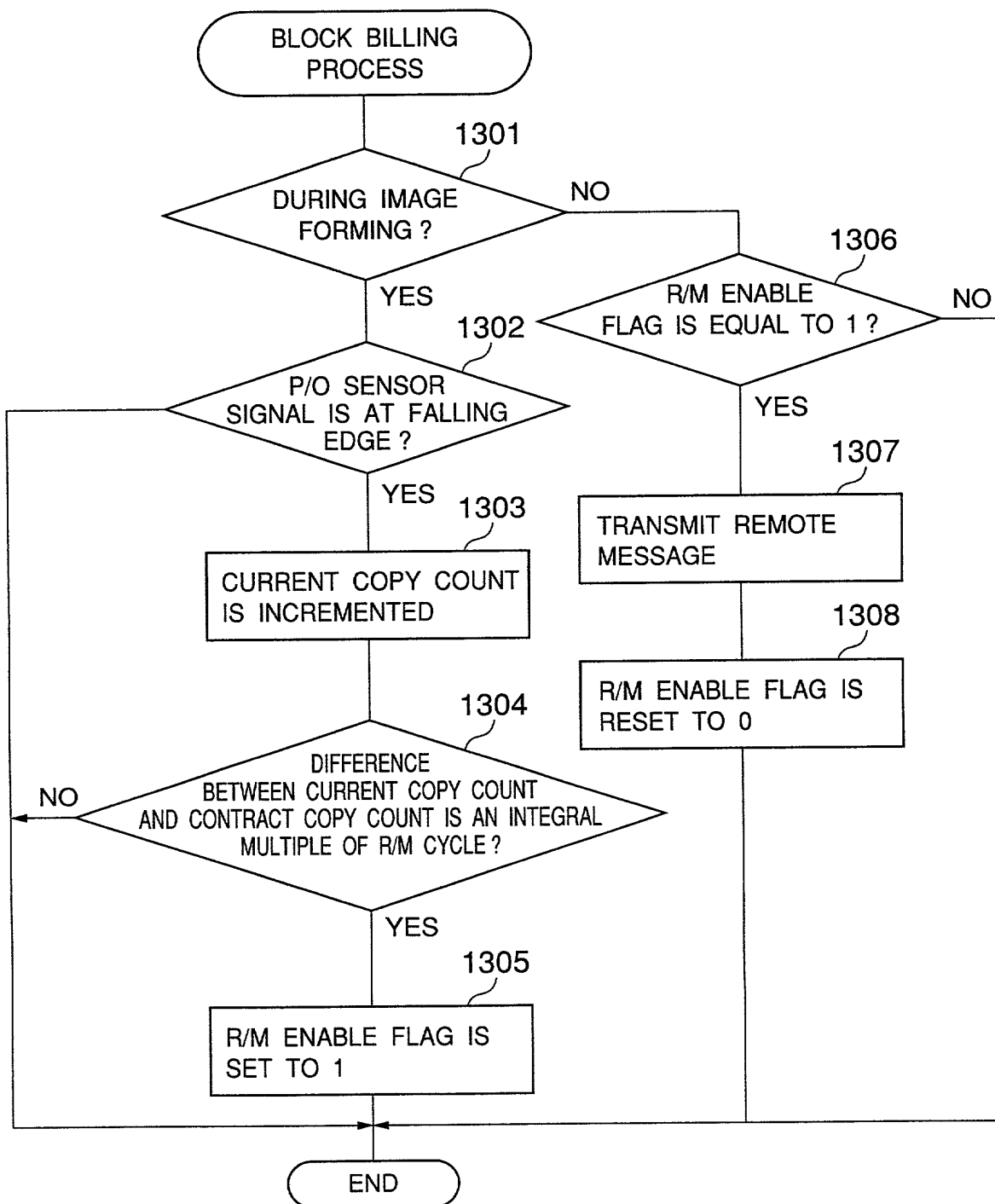


FIG. 57

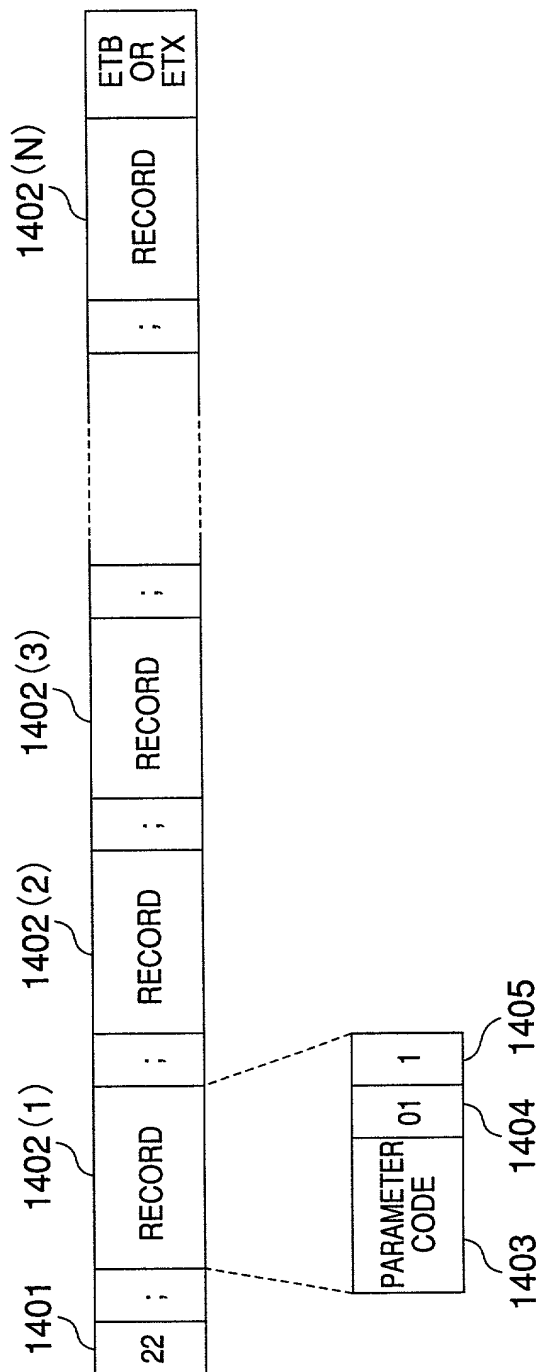


FIG. 58

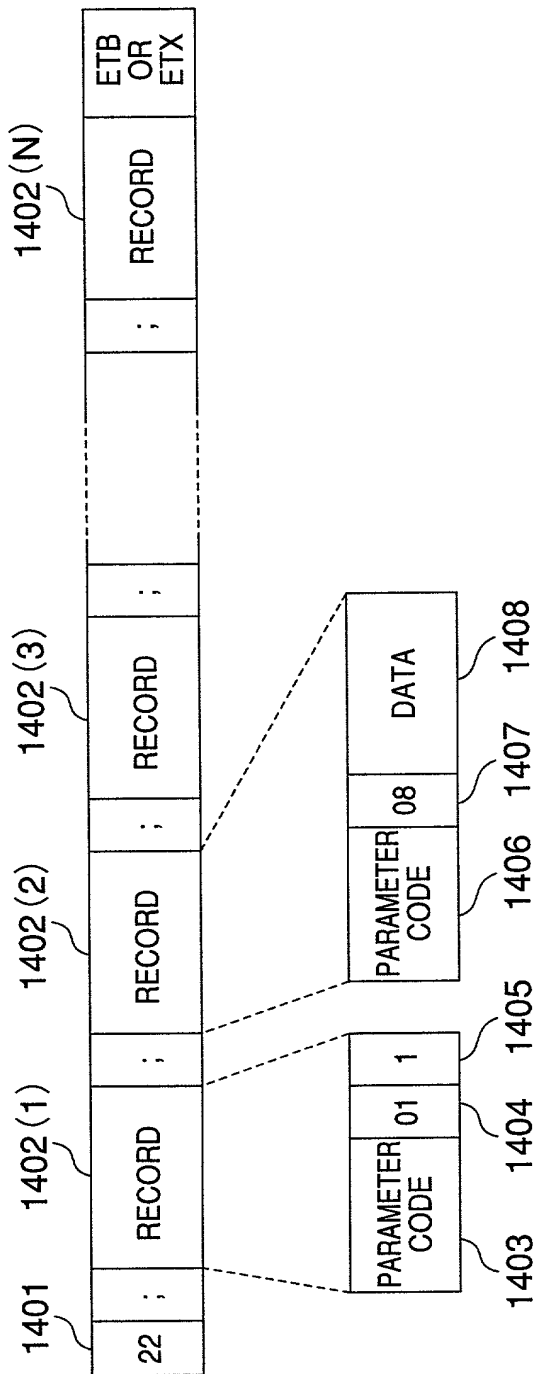
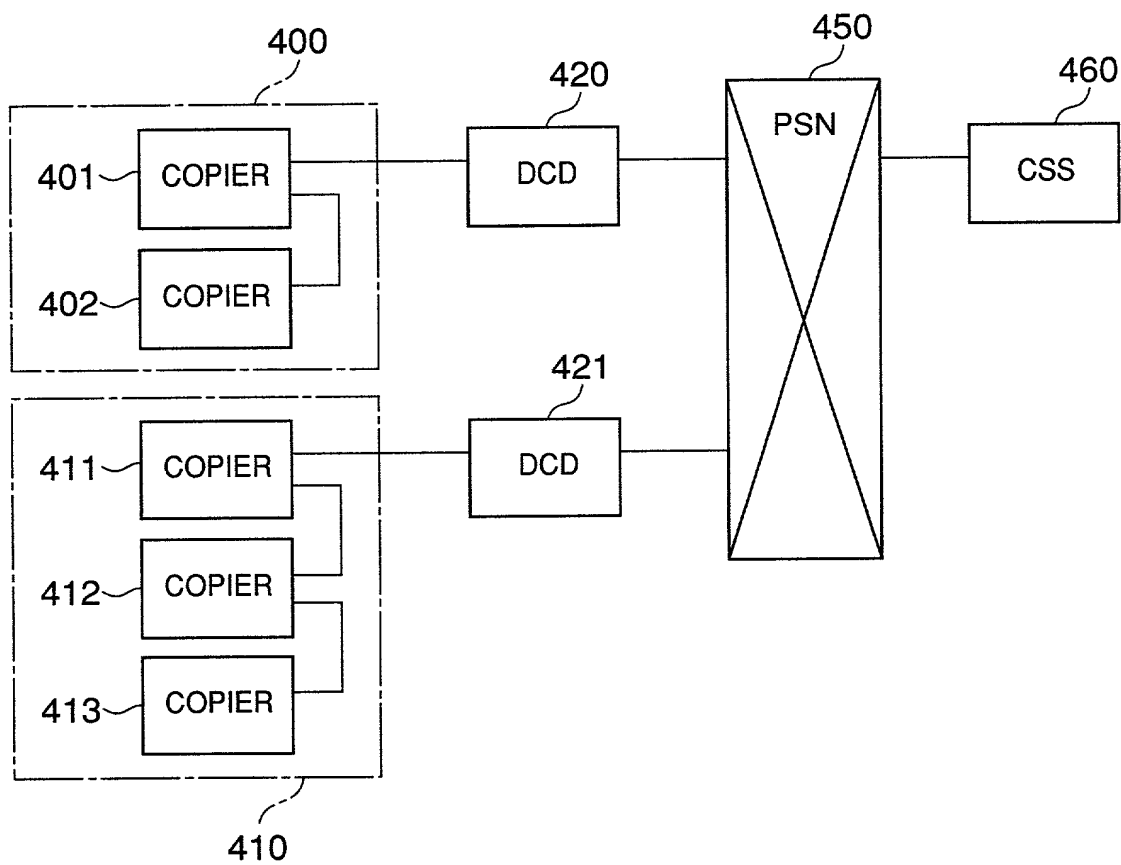


FIG.59

702

CURRENT COPY COUNT	1 0 0 1 2 0	USER TOOL	5
CONTRACT COPY COUNT	1 2 5 0 0 0	BLOCK BILLING	
		PREVIOUS	END
		NEXT	UPPER CLASS
			LOWER CLASS

FIG.60



Overall sample		Non-affected		Affected	
	Mean	SD	Mean	SD	Mean
Demographic data					
Age (years)	34.2	10.1	34.2	10.1	34.2
Gender					
Male	50.0		50.0		50.0
Female	50.0		50.0		50.0
Education (years)	12.5	2.5	12.5	2.5	12.5
Occupation					
Professional	30.0		30.0		30.0
Non-professional	70.0		70.0		70.0
Marital status					
Married	60.0		60.0		60.0
Single	40.0		40.0		40.0
Family size	3.5	1.5	3.5	1.5	3.5
Psychological data					
Depression (BDI-II)	15.5	10.5	15.5	10.5	15.5
Anxiety (BAI)	12.5	10.5	12.5	10.5	12.5
Stress (SSRS)	25.5	10.5	25.5	10.5	25.5
Life satisfaction (SLSS)	45.5	10.5	45.5	10.5	45.5
Quality of life (QoL)	55.5	10.5	55.5	10.5	55.5
Health-related quality of life (HRQoL)	65.5	10.5	65.5	10.5	65.5
Physical functioning (SF-36)	75.5	10.5	75.5	10.5	75.5
Role-physical (SF-36)	85.5	10.5	85.5	10.5	85.5
Bodily pain (SF-36)	95.5	10.5	95.5	10.5	95.5
General health (SF-36)	105.5	10.5	105.5	10.5	105.5
Energy/fatigue (SF-36)	115.5	10.5	115.5	10.5	115.5
Social functioning (SF-36)	125.5	10.5	125.5	10.5	125.5
Emotional role (SF-36)	135.5	10.5	135.5	10.5	135.5
Mental health (SF-36)	145.5	10.5	145.5	10.5	145.5
Health perception (SF-36)	155.5	10.5	155.5	10.5	155.5
Physical role (SF-36)	165.5	10.5	165.5	10.5	165.5
Emotional role (SF-36)	175.5	10.5	175.5	10.5	175.5
Mental health (SF-36)	185.5	10.5	185.5	10.5	185.5
Health perception (SF-36)	195.5	10.5	195.5	10.5	195.5
Physical role (SF-36)	205.5	10.5	205.5	10.5	205.5
Emotional role (SF-36)	215.5	10.5	215.5	10.5	215.5
Mental health (SF-36)	225.5	10.5	225.5	10.5	225.5
Health perception (SF-36)	235.5	10.5	235.5	10.5	235.5
Physical role (SF-36)	245.5	10.5	245.5	10.5	245.5
Emotional role (SF-36)	255.5	10.5	255.5	10.5	255.5
Mental health (SF-36)	265.5	10.5	265.5	10.5	265.5
Health perception (SF-36)	275.5	10.5	275.5	10.5	275.5
Physical role (SF-36)	285.5	10.5	285.5	10.5	285.5
Emotional role (SF-36)	295.5	10.5	295.5	10.5	295.5
Mental health (SF-36)	305.5	10.5	305.5	10.5	305.5
Health perception (SF-36)	315.5	10.5	315.5	10.5	315.5
Physical role (SF-36)	325.5	10.5	325.5	10.5	325.5
Emotional role (SF-36)	335.5	10.5	335.5	10.5	335.5
Mental health (SF-36)	345.5	10.5	345.5	10.5	345.5
Health perception (SF-36)	355.5	10.5	355.5	10.5	355.5
Physical role (SF-36)	365.5	10.5	365.5	10.5	365.5
Emotional role (SF-36)	375.5	10.5	375.5	10.5	375.5
Mental health (SF-36)	385.5	10.5	385.5	10.5	385.5
Health perception (SF-36)	395.5	10.5	395.5	10.5	395.5
Physical role (SF-36)	405.5	10.5	405.5	10.5	405.5
Emotional role (SF-36)	415.5	10.5	415.5	10.5	415.5
Mental health (SF-36)	425.5	10.5	425.5	10.5	425.5
Health perception (SF-36)	435.5	10.5	435.5	10.5	435.5
Physical role (SF-36)	445.5	10.5	445.5	10.5	445.5
Emotional role (SF-36)	455.5	10.5	455.5	10.5	455.5
Mental health (SF-36)	465.5	10.5	465.5		

[illegible]

FIG.62A

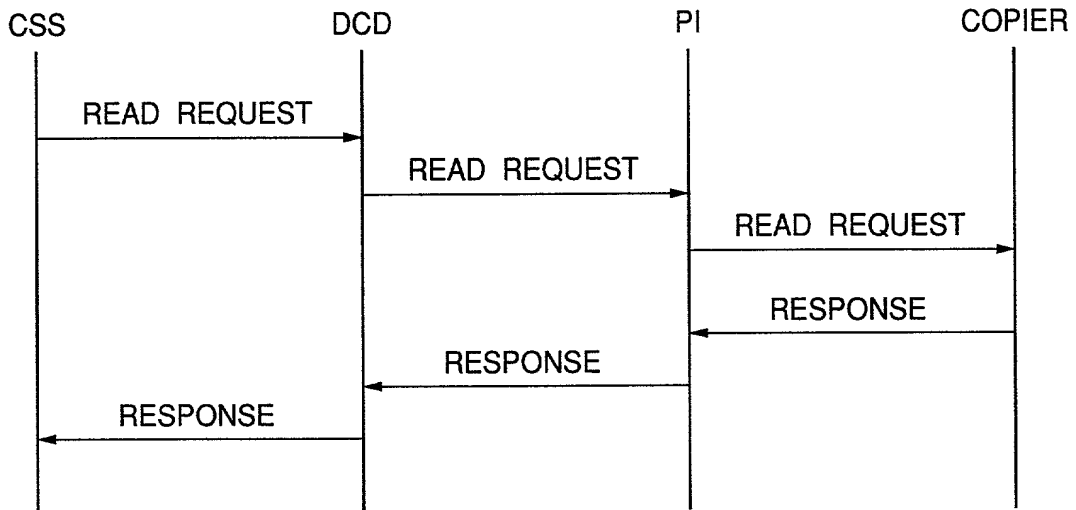


FIG.62B

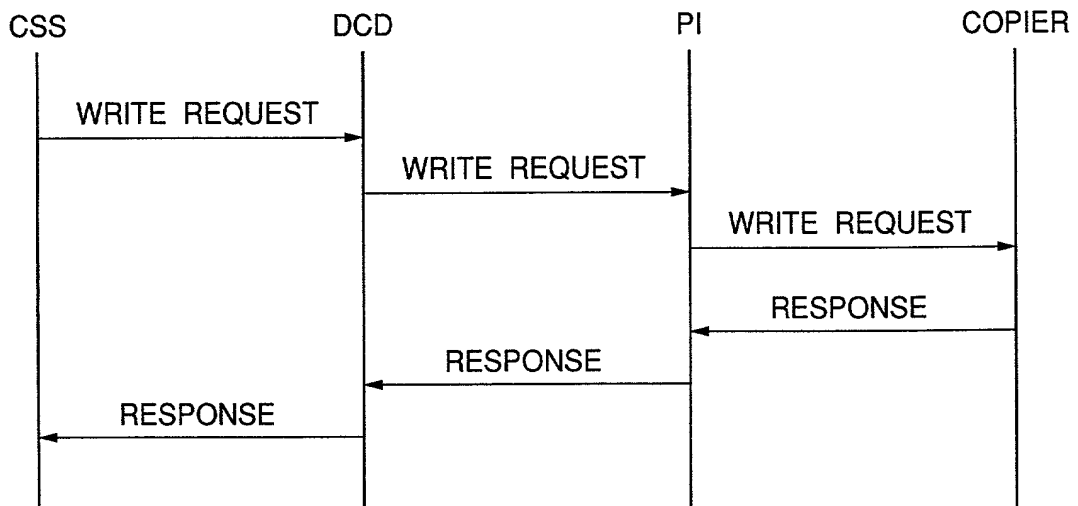


FIG.63

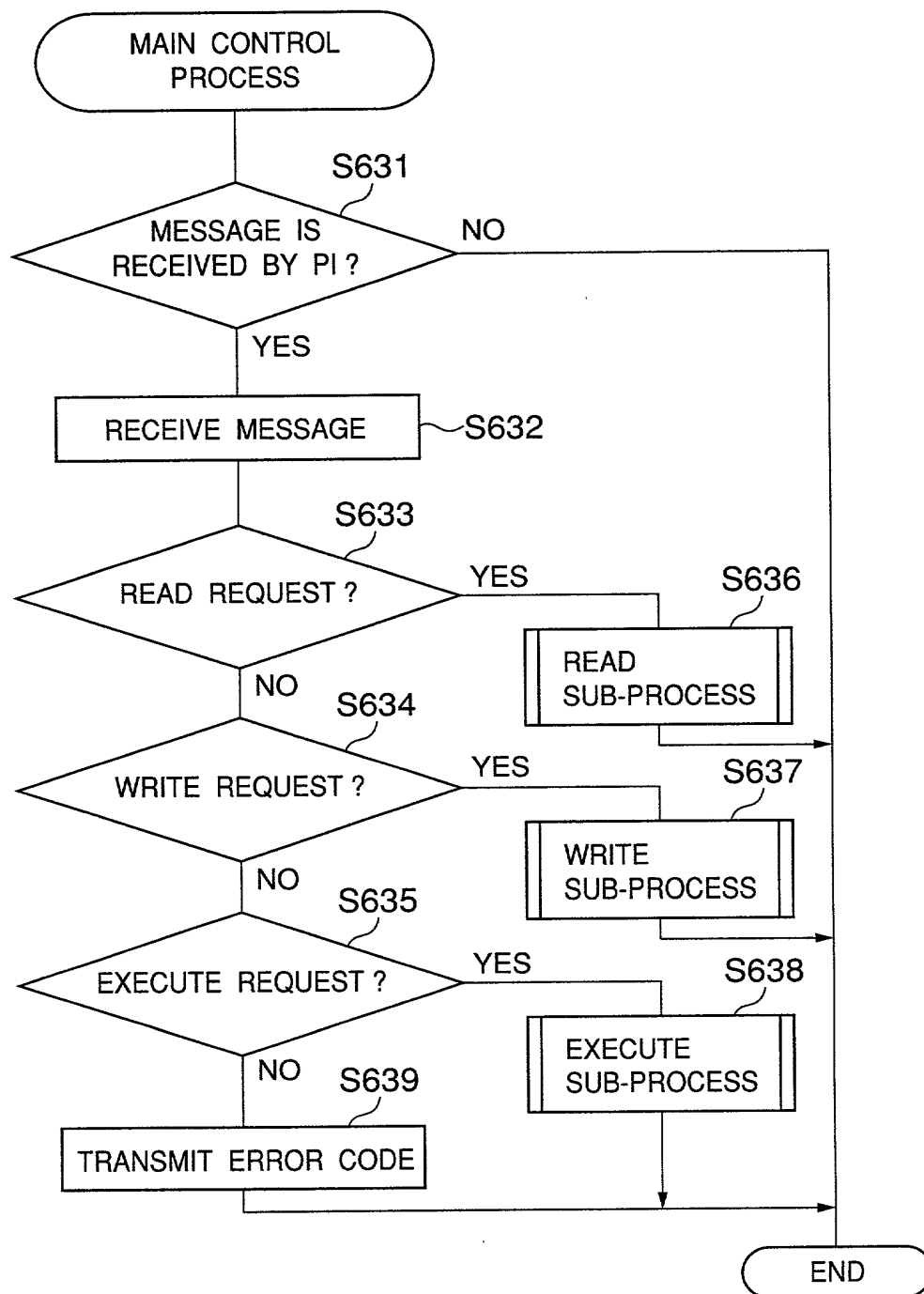


FIG.64

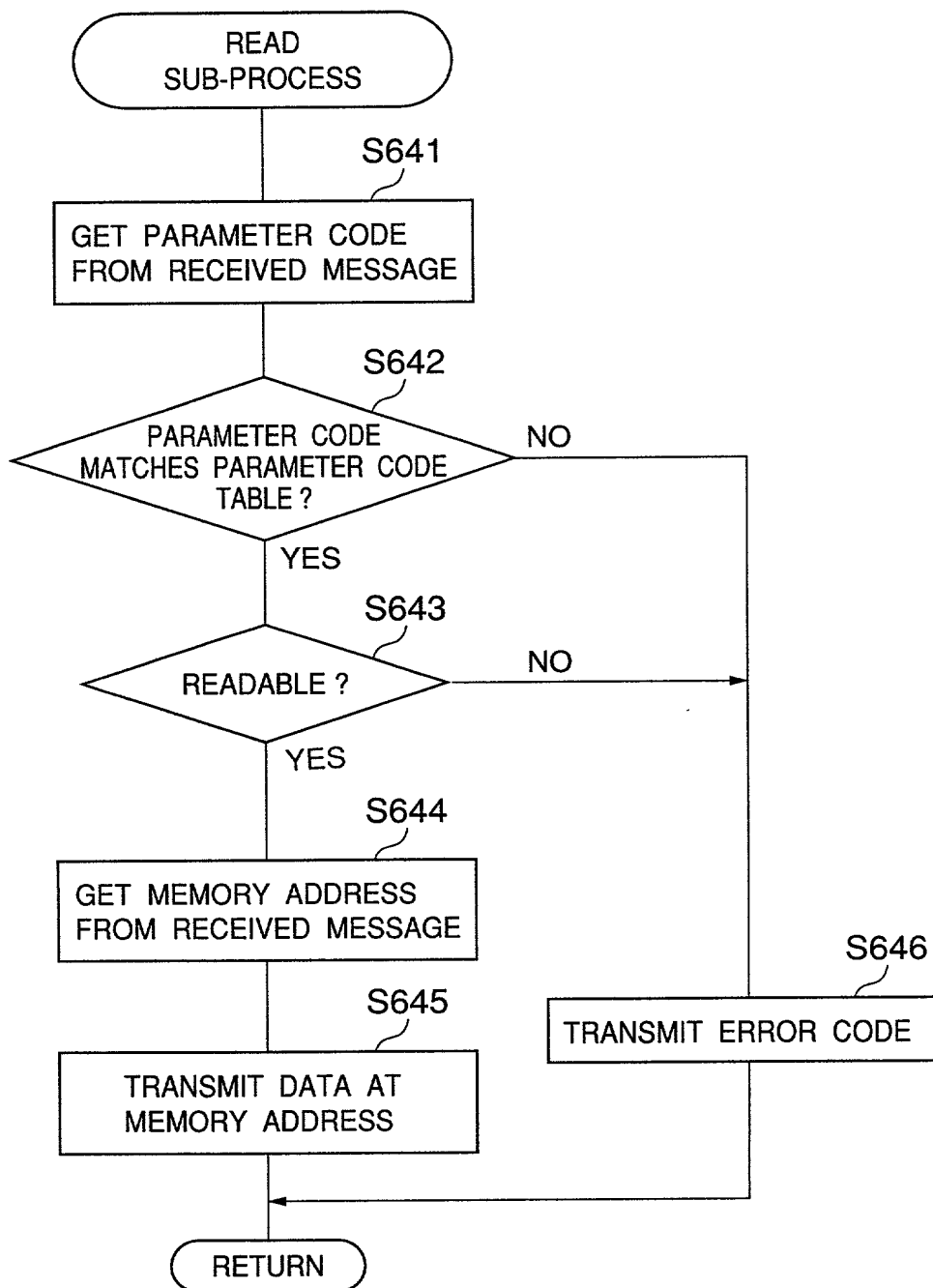


FIG.65

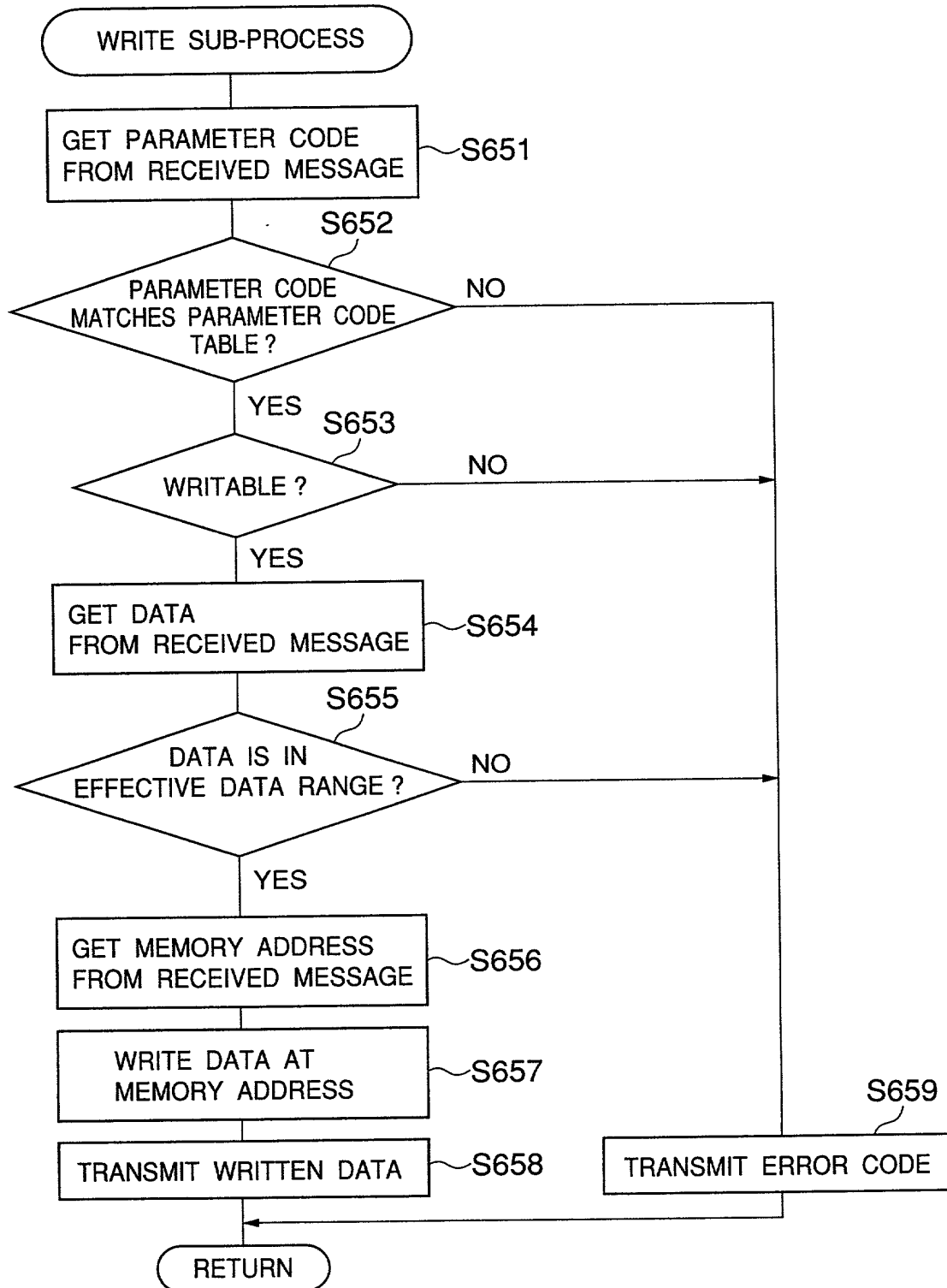


FIG.66

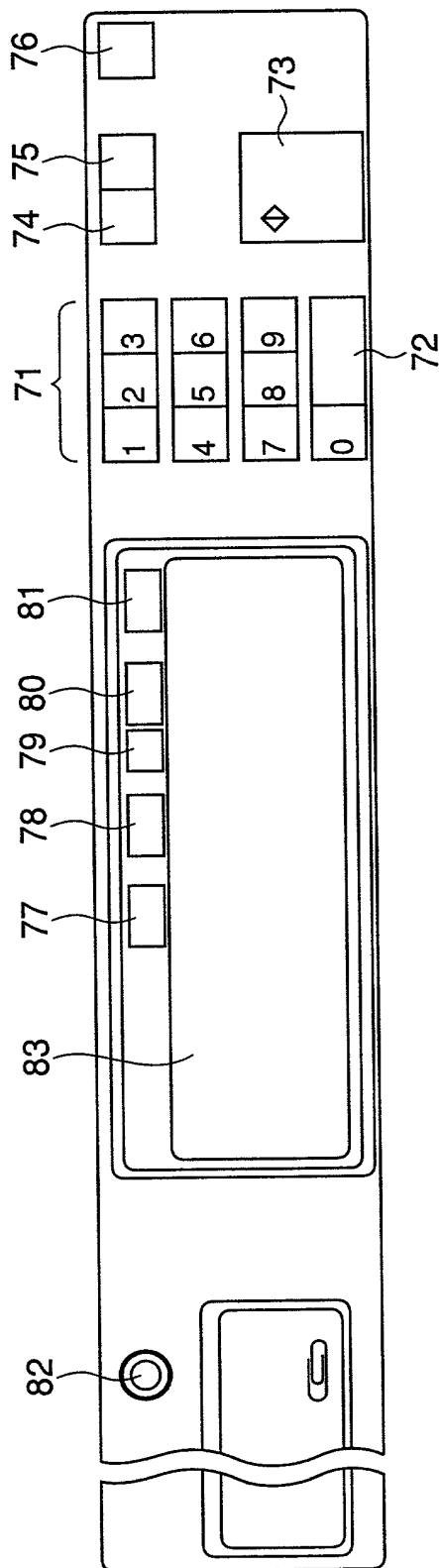


Table 1. (continued)	
Variable	Mean (SD)
Age (years)	22.5 (1.5)
Gender	
Male	100 (100%)
Female	0 (0%)
Marital status	
Married	0 (0%)
Single	100 (100%)
Education (years)	12.5 (1.5)
Occupation	
Student	100 (100%)
Other	0 (0%)
Religion	
Muslim	100 (100%)
Other	0 (0%)
Family size	4.5 (1.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)
Parental education (years)	10.5 (2.5)
Parental occupation	
Farmer	100 (100%)
Other	0 (0%)
Parental religion	
Muslim	100 (100%)
Other	0 (0%)
Parental family size	4.5 (1.5)
Parental marital status	
Married	100 (100%)
Single	0 (0%)
Parental gender	
Male	100 (100%)
Female	0 (0%)
Parental age (years)	35.5 (5.5)

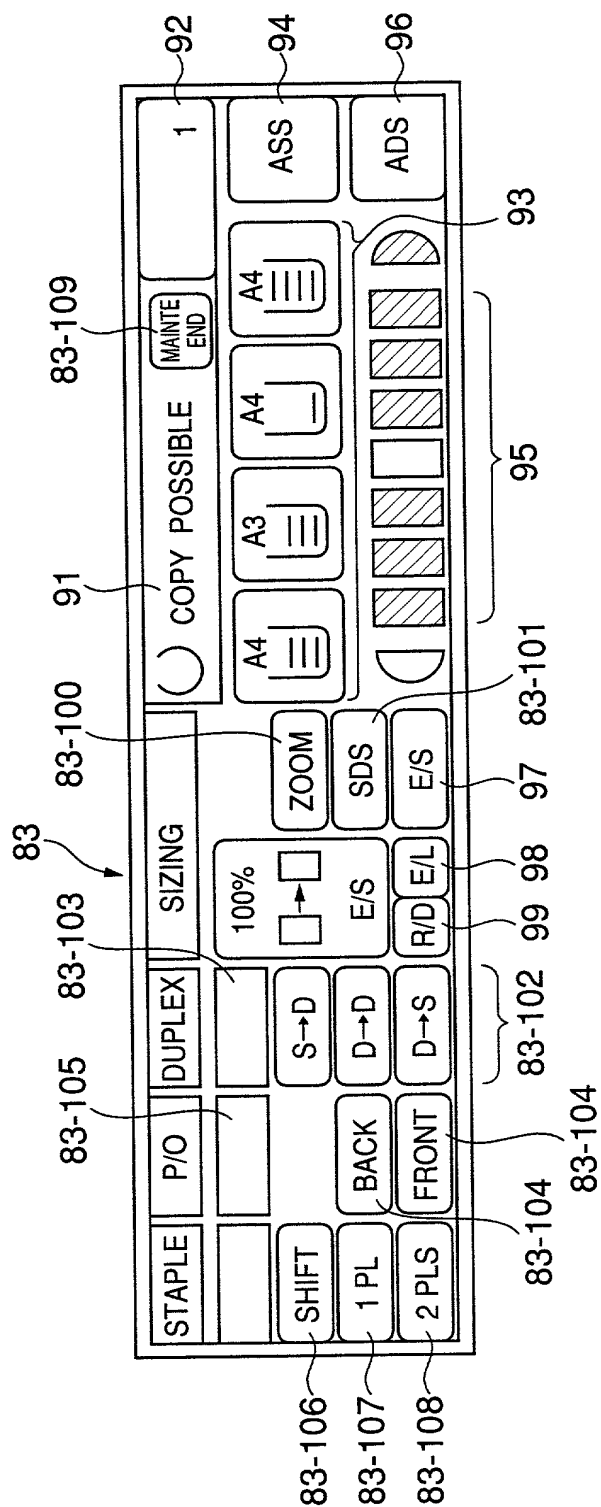


FIG.68

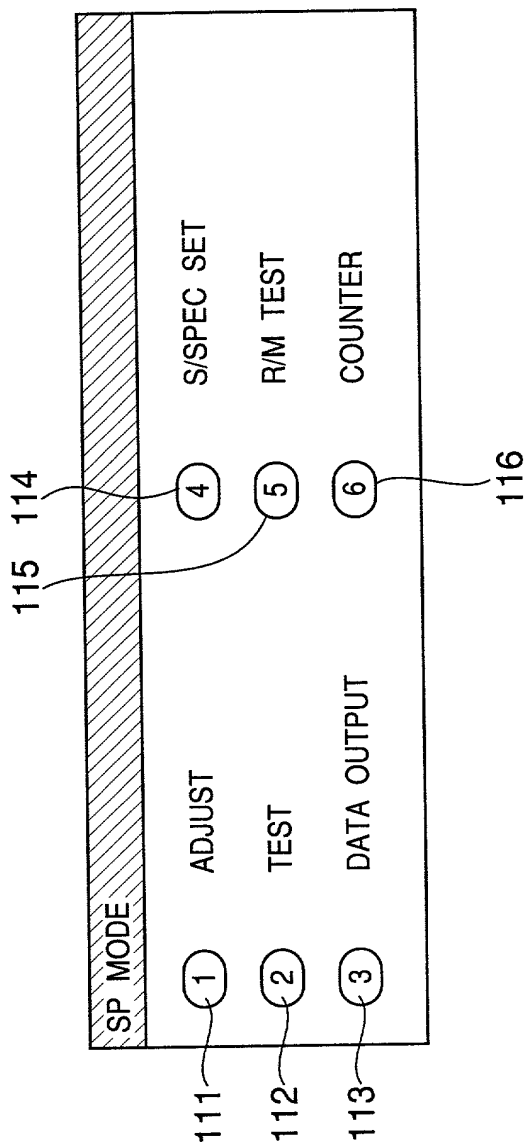


FIG.69

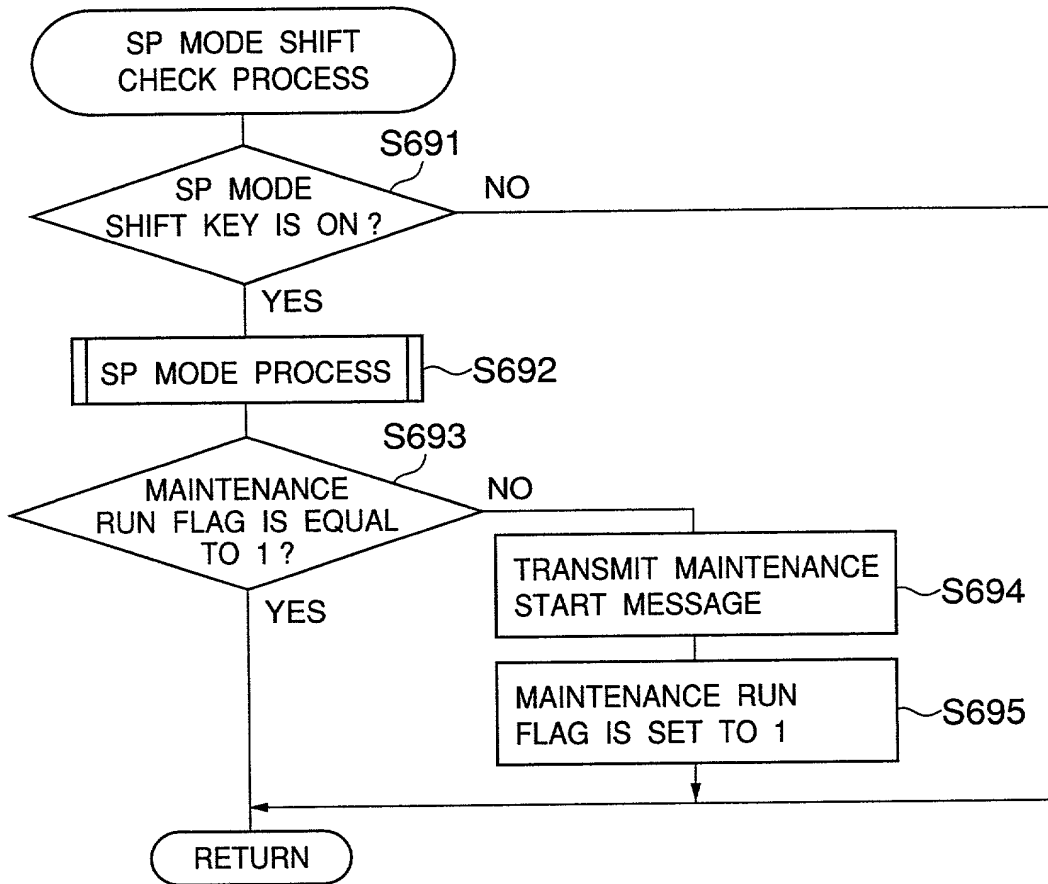


FIG.70

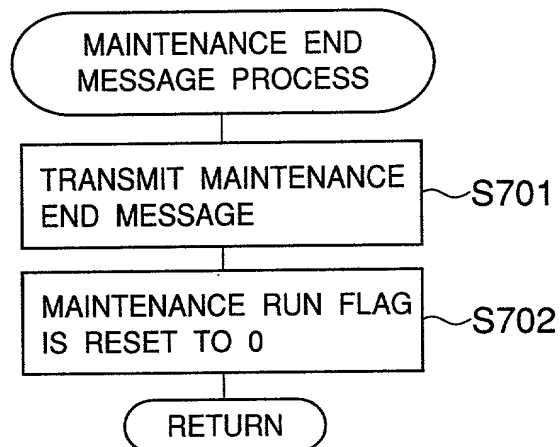


FIG.71

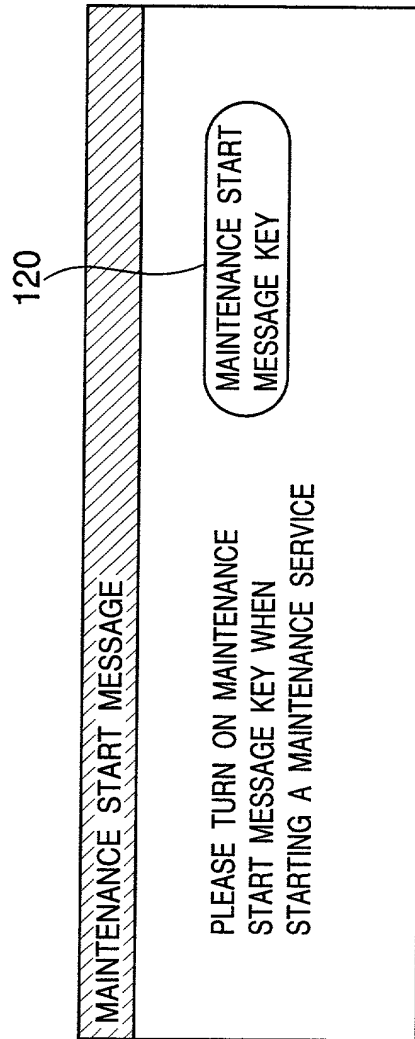


FIG.72

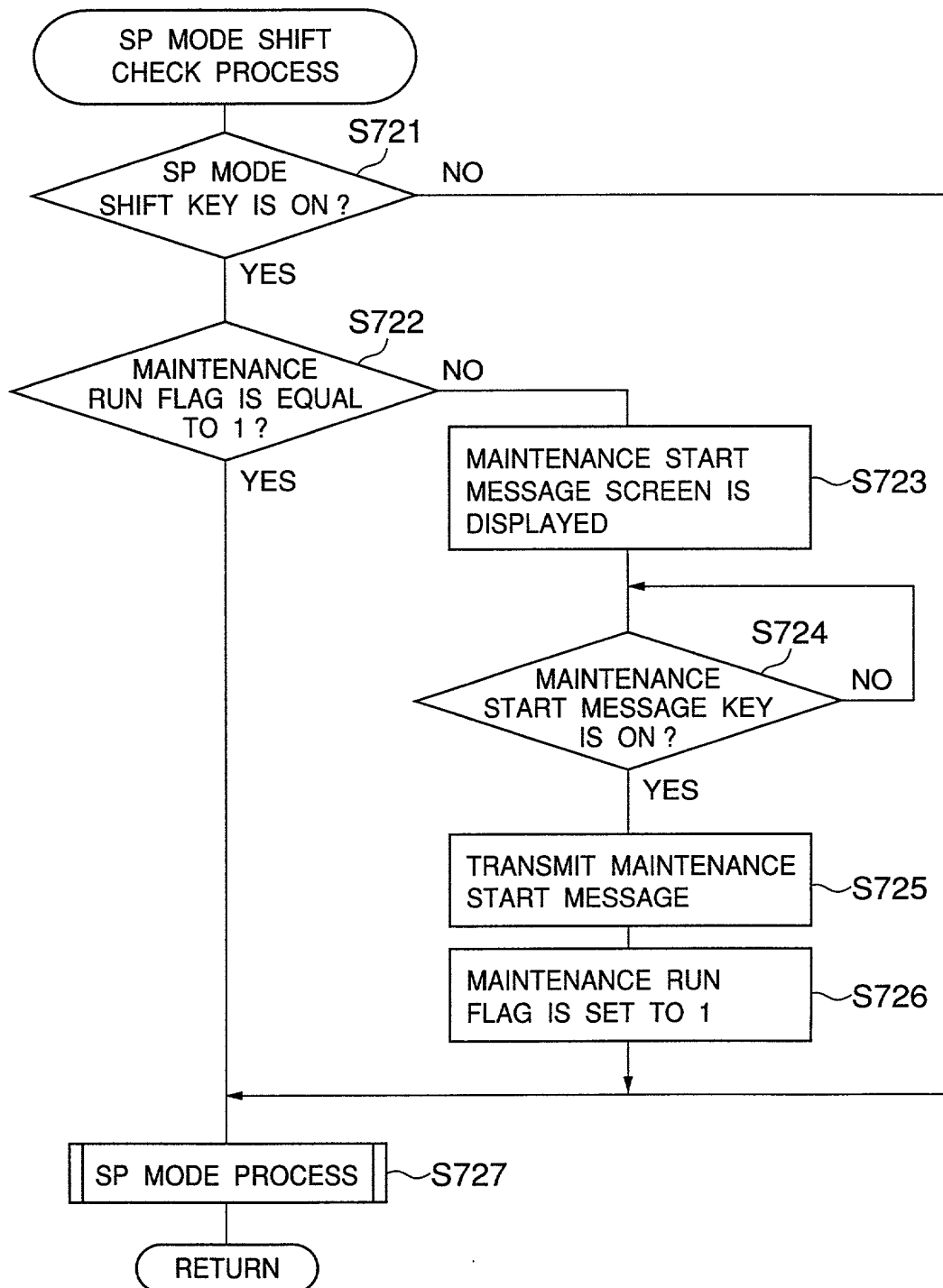


FIG.73

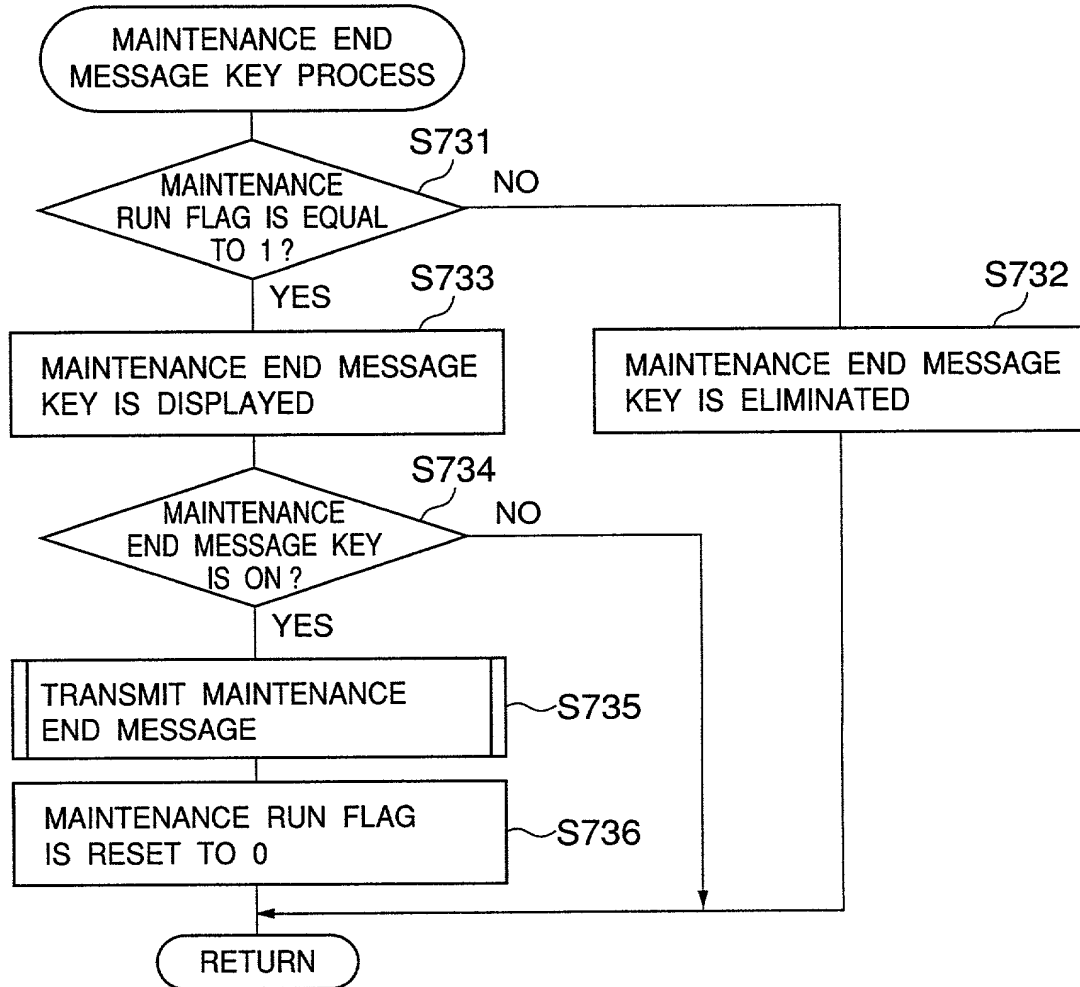


FIG.74A

PROCESS CODE										NO. OF DIGITS					
PARAMETER CODE										DATA					
3	1	:	3	3	0	0	0	1	0	1	0	0	0	1	1

FIG.74B

PROCESS CODE										NO. OF DIGITS						
PARAMETER CODE										DATA						
3	1	:	3	3	0	0	0	0	1	0	2	0	0	0	1	1